TRANSACTIONS

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and
OTOLARYNGOLOGY

MARCH - APRIL
1960

Volume 64 Number 2

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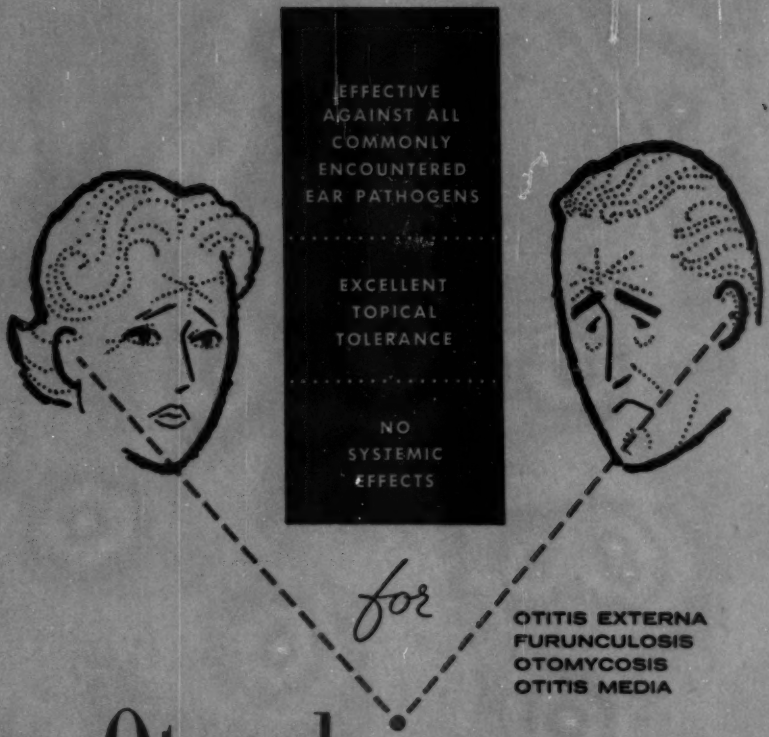

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American Academy of Ophthalmology and Otolaryngology

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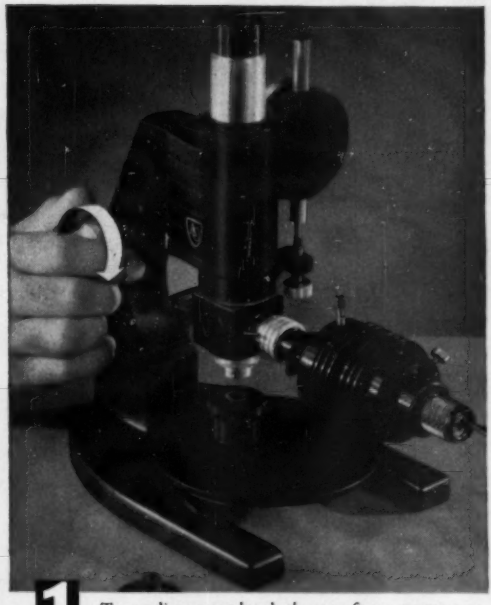

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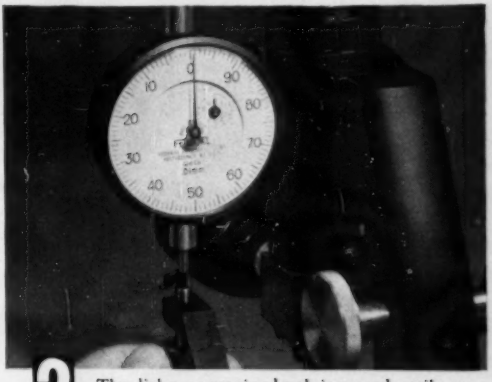
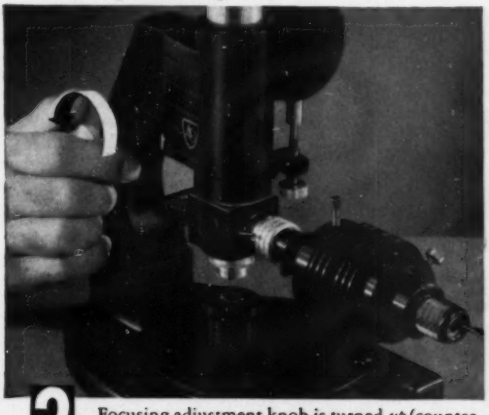
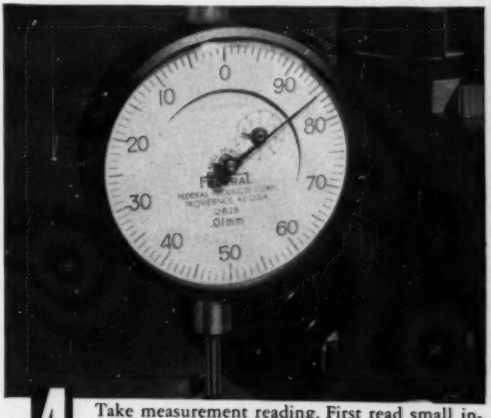


2 The dial gage zeroing knob is turned until a zero reading appears on the small inner dial and the large outer dial.



3 Focusing adjustment knob is turned *up* (counterclockwise) until a second target image appears. Bring this image into sharp focus.



4 Take measurement reading. First read small inner dial...then large outer dial. Adding both figures will give you the curvature of lens surface in hundredths of millimeters.

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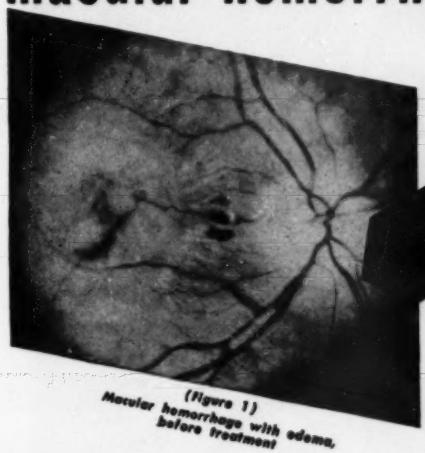

(Figure 1)
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(Figure 2)
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1. *Am. J. Ophth.* 42:771, 1956.
2. *Am. J. Digest Dis.* 22:5, 1955.
3. *Med. Times* 84:741, 1956.
4. *Cecil's Textbook of Medicine*, 7th ed., 1947, p. 1598.

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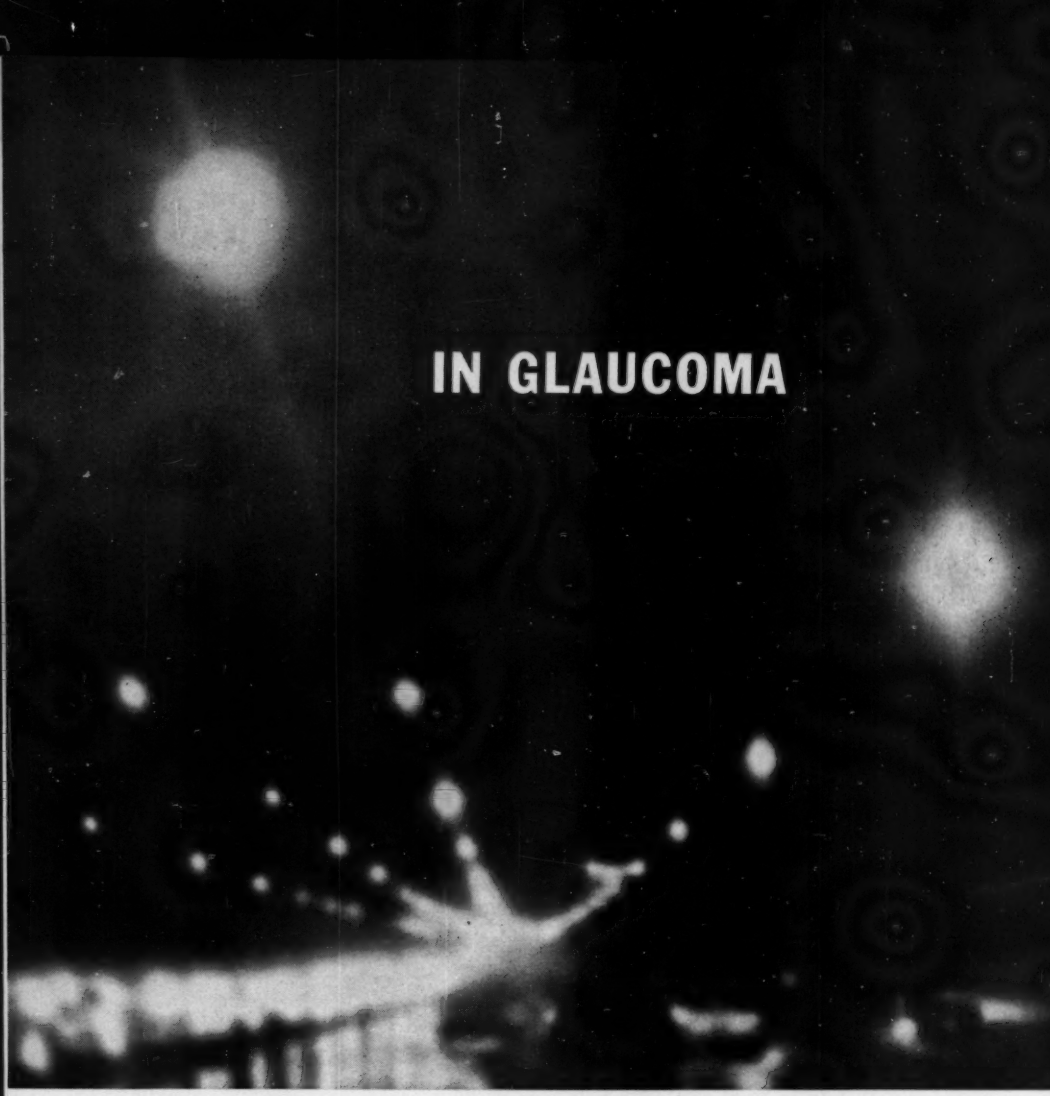

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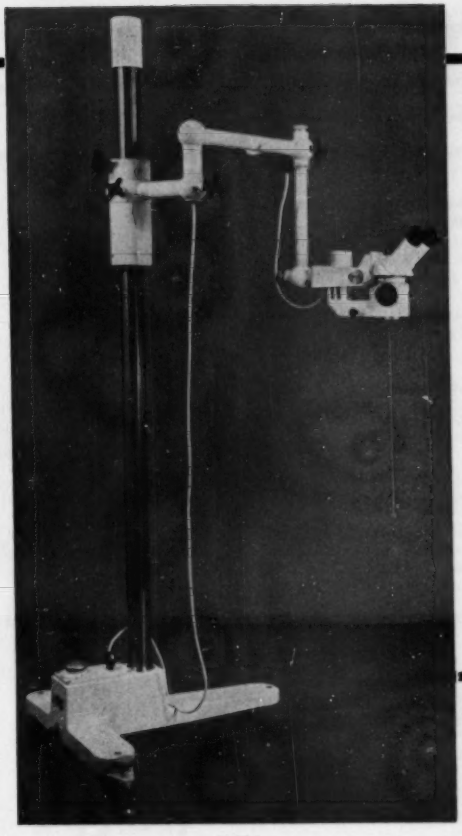

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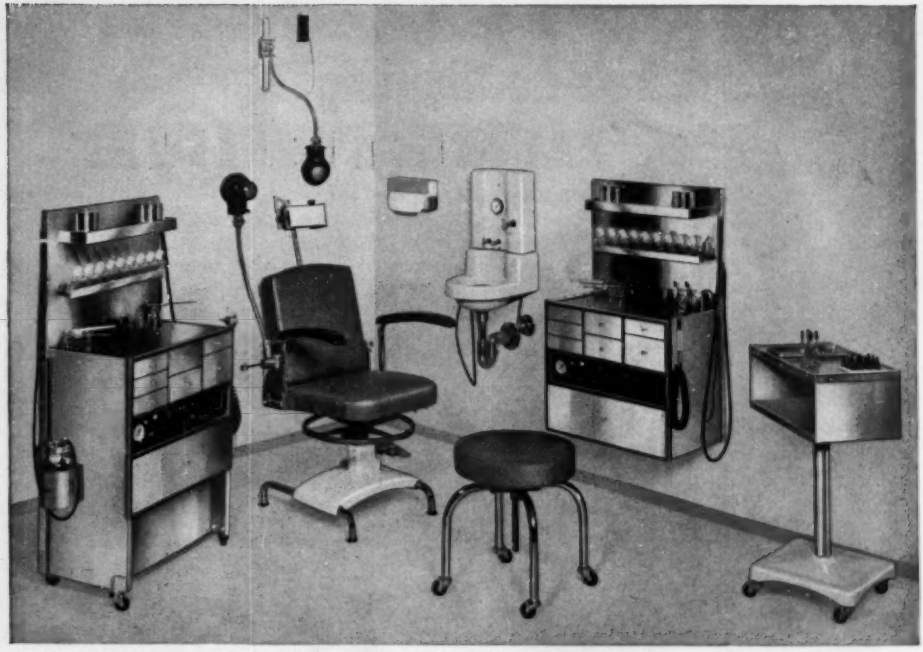

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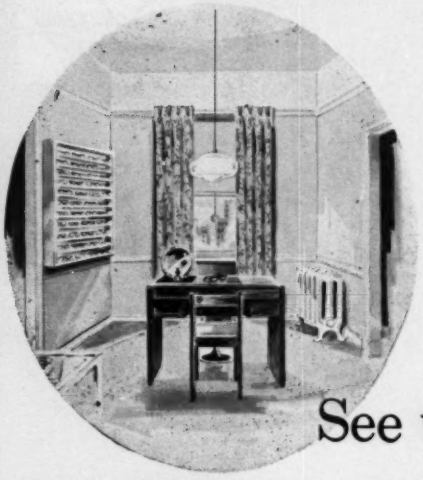

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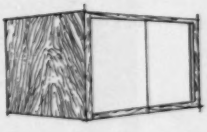

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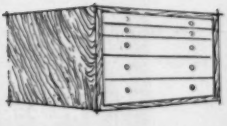

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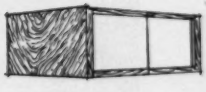

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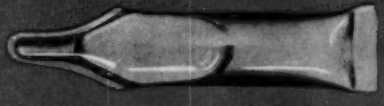

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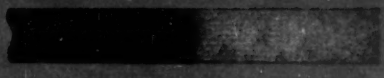

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*E. Cheraskin: The Control of Bleeding, J. Am. Dent. Assn., 58:17 (Apr., 1959).

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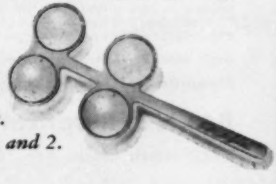

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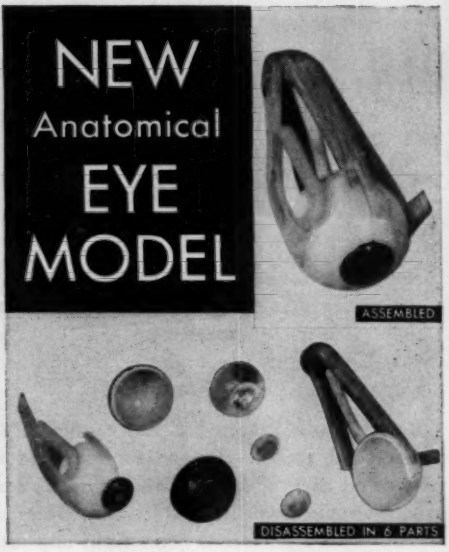

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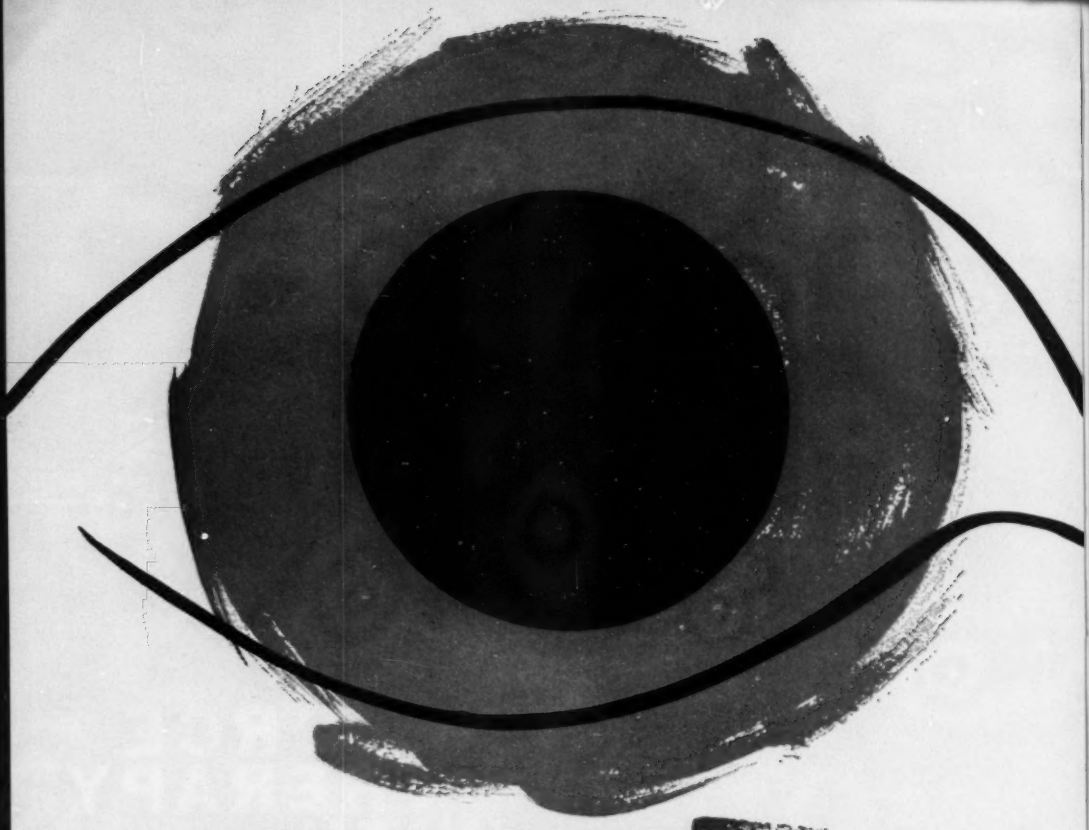
(1) Gordon, D. M.: Am. J. Ophth. 47:536, 4/1959 • (2) Baker, W. B.: Aspects of Several Antibiotics, Drug & Cosmetic Industry, 12/1954



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March 8-9-10	March 11	Washington, D. C.	Statler
March 15-16-17	March 18	Salt Lake City, Utah	Utah
March 22-23-24	March 25	New York, New York	‡Vision Center
April 5-6-7	April 8	Los Angeles, California	Ambassador
April 12-13-14	April 15	Phoenix, Arizona	Westward Ho
April 19-20-21	April 22	Miami, Florida	McAllister
April 26-27-28	April 29	New Orleans, Louisiana	Jung
May 3-4-5	May 6	St. Louis, Missouri	Coronado
May 10-11-12	May 13	Dallas, Texas	Sheraton
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1 Girard, L. J., Dukes, C. D., and Fleming, T. C. Presented at the International Congress of Ophth., Brussels, Belgium, 1958.
2 Kara, Gerald B., "The Use of Alpha-Chymotrypsin in Cataract Extraction," Research Report No. 10, Alcon Laboratories, Inc., 1959.
3 Vail, D., et. al. Report: Committee on use of alpha-chymotrypsin in ophthalmology. Presented at the Sixty-fourth Annual Session, American Academy of Ophthalmology and Otolaryngology, Chicago, Oct. 11-16, 1959. (To be published)

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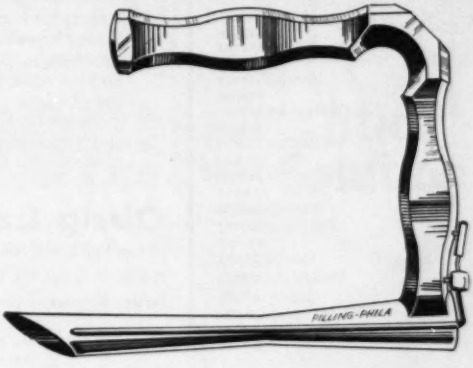

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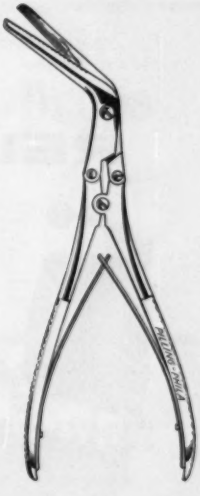

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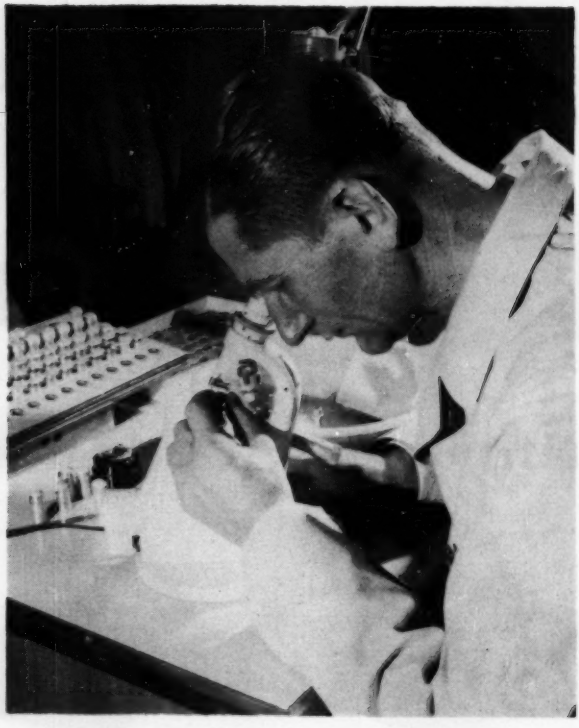

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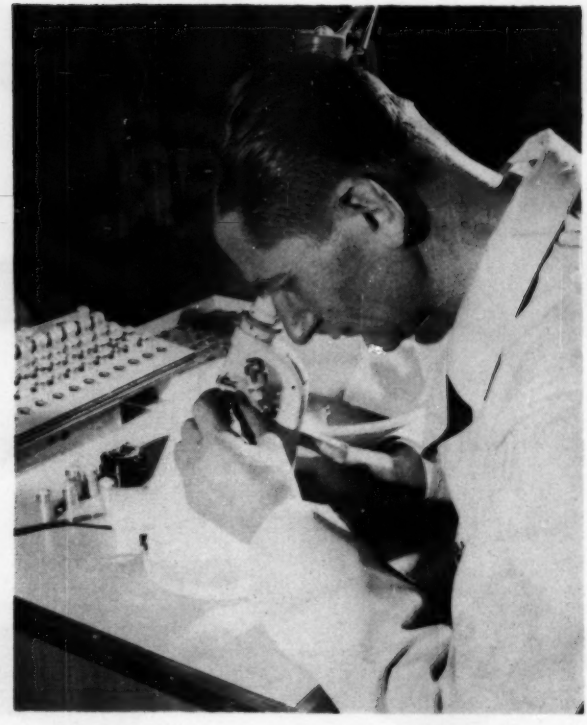

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SYMPOSIUM: OFFICE MANAGEMENT OF THE PRIMARY GLAUCOMAS

I. *Introduction*

F. Bruce Fralick, M.D.
ANN ARBOR, MICHIGAN

Your program committee has assigned to this panel the difficult task of outlining for you what we would consider practical and efficient office management of the primary glaucomas. Because of the complex nature of this subject we have found that it will be necessary to make many arbitrary statements without explanation, since time does not permit much detail.

Our aim is to clarify the diagnostic steps needed in primary glaucoma detection and to outline what we consider adequate office management, once the diagnosis is made. We will attempt to present laboratory data from recently completed glaucoma research projects which can be applied directly in our offices to the management of glaucoma.

The terms to be used in this symposium—that is, simple glaucoma and angle-closure glaucoma—are those adopted by the Symposium on Glaucoma sponsored by the Council for International Organizations of Medical Sciences held in Canada in September 1954.

The symposium will be conducted by means of having each member of the panel discuss briefly an assigned portion of the material to be covered. Following each introductory discussion, pertinent questions concerning the matter covered will be presented to the panel. It is hoped by this means that we will be of some help in your office management of glaucoma.

At this time I would like to introduce the members of the panel:

Dr. George M. Haik, New Orleans

Dr. Robert N. Shaffer, San Francisco

Dr. Bernard Becker, St. Louis

Dr. W. Howard Morrison, Omaha

Dr. Haik, would you start the symposium by a discussion of the classification, signs and symptoms which your office patients might give that would suggest the presence of the primary glaucomas?

II. *Classification, Signs and Symptoms of the Primary Glaucomas*

GEORGE M. HAIK, M.D.
NEW ORLEANS, LOUISIANA

Definition

Glaucoma may be defined as a disease in which the intraocular pressure is elevated to a degree that the eye cannot tolerate without damage to its structures. The increased intraocular pressure may be intermittent or constant. In the interpretation of this definition, it must be remembered that the intraocular pressure varies from individual to individual, as well as at different times in the same individual. Furthermore, susceptibility to pressure damage also varies. Glaucomatous damage may therefore occur in eyes in which the pressure appears to be well within the so-called "normal" range.

Classification

The numerous classifications of glaucoma employed in the past have resulted in considerable confusion. Current classifications are made by gonioscopy and based on whether or not the angle is open or is capable of closure.

This classification is as follows:

I. Angle-closure (narrow angle) glaucoma, which is further classified as:
   A. Acute—complete obstruction to outflow
   B. Intermittent—varying degrees of obstruction
   C. Chronic—outflow sufficiently obstructed by anterior synechias so that the tension remains constantly elevated

II. Chronic simple (open angle, wide angle) glaucoma, which is further classified as:
   A. Impaired outflow:
      1. Early—before damage to optic nerve
      2. Established — damaged optic nerve
      3. Advanced—markedly damaged optic nerve
   B. Normal outflow (hypersecretion glaucoma)

III. Combined glaucoma, which is further classified as:
   A. Simple glaucoma complicated by angle closure
   B. Angle-closure glaucoma with permanent trabecular damage resulting in increased resistance to aqueous outflow but associated with few, if any, peripheral anterior synechias

Diagnosis

In most cases of glaucoma the diagnosis can be confirmed or ruled out by the combination of a careful history and a complete eye examination. There is, however, a considerable group of borderline cases which present problems and in which the diagnosis is finally established or ruled out only by the use of all available techniques supplemented by a period of frequent, careful observation. Observation over a period of time, in fact, is often the most important part of the investigation.

I. ANGLE-CLOSURE GLAUCOMA

Mechanism

In angle-closure glaucoma, the filtration apparatus itself is normal and the obstruction to the outflow of aqueous is due to closure of the angle by contact between the iris root and the trabecular wall (fig. 1). As a result of this obstruction, the aqueous has no access to the filtration apparatus. At a later stage, or after repeated episodes of angle closure,

there may be permanent damage to the outflow channels.

In angle-closure glaucoma, the shallower the anterior chamber and the narrower the angle anatomically, the more likely is glaucoma to develop. The myopic eye is not immune to the disease, but it is generally agreed that this type of glaucoma is more likely to occur in hyperopic eyes. Continued growth of the lens throughout life is believed to contribute to the further narrowing of the angle with age.

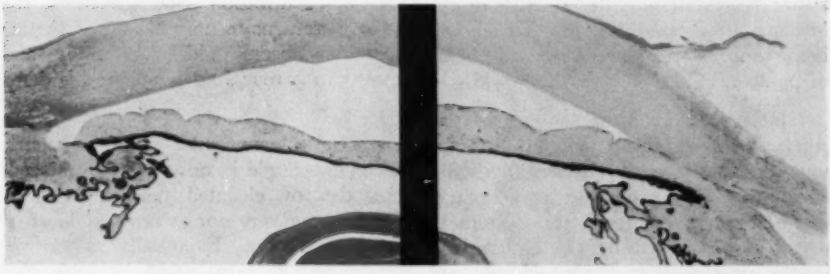

FIG. 1—Patient died 24 hours after an acute attack of angle-closure glaucoma. (Left) Right eye shows a predisposition to angle-closure glaucoma. (Right) Left eye shows angle-closure glaucoma. (Courtesy of Dr. Merrill J. Reeh)

Family History

It seems likely that in this type of disease the inherited factor is not the glaucomatous disease itself but the predisposition to a shallower anterior chamber and high hyperopia.

Clinical Picture and Precipitating Factors

In angle-closure glaucoma, most cases start out with mild and brief episodes of raised intraocular pressure which are associated with definite symptoms. In the early stages, attacks are followed by normal intervals in which the only evident defect is a shallow anterior chamber with a narrow angle. These are anatomic abnormalities which have always been present and which may exist for many years before difficulties arise. Their existence, however, is a warning that angle closure may occur.

Attacks of angle-closure glaucoma can frequently be related to such precipitating factors as the following:

1. Worry or emotional excitement, such as a death in the family. One of our own patients, who has steadfastly refused surgical intervention, invariably has an attack after working on his income tax.
2. The use of mydriatics, whether as a provocative test or without recognition of the existence of glaucoma.
3. Watching motion pictures or television, driving at night, or working with reduced illumination.

In the early stages of angle-closure glaucoma, so-called prodromal symptoms merge into clear-cut symptoms, the difference being not in the clinical picture itself but in its intensity. Early symptoms include:

1. Transient blurring of vision.
2. Rainbow-colored halos, with the blue-violet color nearest the light.

3. Slight pain in the head or in the eye.

At this stage very slight circumcorneal injection may be present. However, in early cases there is often no physical evidence of the disease beyond the preexistent anatomic abnormalities already described.

While acute congestive angle-closure glaucoma may occur independent of any previous attack, it frequently follows the prodromal symptoms just described. The pain is often severe enough to cause nausea, vomiting, chills and bradycardia. If the involvement is unilateral, the visual impairment may not be realized and an internist may be called because of the headache and vomiting, the visual loss being appreciated only after the relief of pain.

External examination shows the conjunctival vessels to be dilated and tortuous and all the ocular tissues markedly edematous. Other findings may include loss of corneal sensitivity and cloudiness of the cornea, which may be so involved in the process that fundus details are obscured. There may be cells in the anterior chamber, and an occasional posterior synechia may be present. The anterior chamber is usually shallow, but the axial depth is sometimes normal. The pupil is usually oval and dilated, and the iris is discolored. Later, if the congestive phase persists for some time, there are corneal blebs and vesicles, and the number of synechias increases. It is most important to examine the other eye and determine the condition of the angle; otherwise, the condition may be confused with secondary glaucoma.

In the early phases of angle-closure glaucoma, the nerve head is normal and the visual fields are full. If repeated attacks occur or base pressure remains elevated, changes resulting from pressure may give rise to field changes similar to those found in simple glaucoma, and the disc rapidly becomes atrophic.

If a patient is seen for the first time after an acute congestive attack of angle-closure glaucoma has terminated spontaneously or has been controlled by medication, both iritis and secondary glaucoma must be considered in the differential diagnosis. Pigmented iris atrophy and *glaucomflecken* may be helpful in differential diagnosis.

Initial attacks of angle-closure may last from thirty minutes to several days. The symptoms may subside spontaneously, only to recur at varying intervals, and usually with greater frequency, as time passes. The attacks also tend to be of longer duration. Between them, the tension returns to normal and, if the attack has been mild, gonioscopy and tonography reveal no demonstrable damage.

In the intermittent type of glaucoma, when the angle is only partially closed, episodes of elevated tension may be neither as severe nor as intractable as in acute glaucoma. Eventually, after repeated attacks, portions of the angle may be permanently closed by peripheral anterior synechias, or the trabecular meshwork may be damaged by repeated episodes of angle closure. This results in a rise in the base intraocular pressure, which represents the chronic stage of angle-closure glaucoma.

II. CHRONIC SIMPLE GLAUCOMA

Mechanism

In chronic simple glaucoma (fig. 2), the aqueous has access at all times to the filtration apparatus and the obstruction to its exit from the eye lies in some abnormality of the filtration apparatus itself; that is, the trouble is in the corneoscleral meshwork, Schlemm's canal, or the aqueous veins. Most of the evidence favors that part of the trabecular meshwork bordering Schlemm's canal as the site of resistance to outflow.

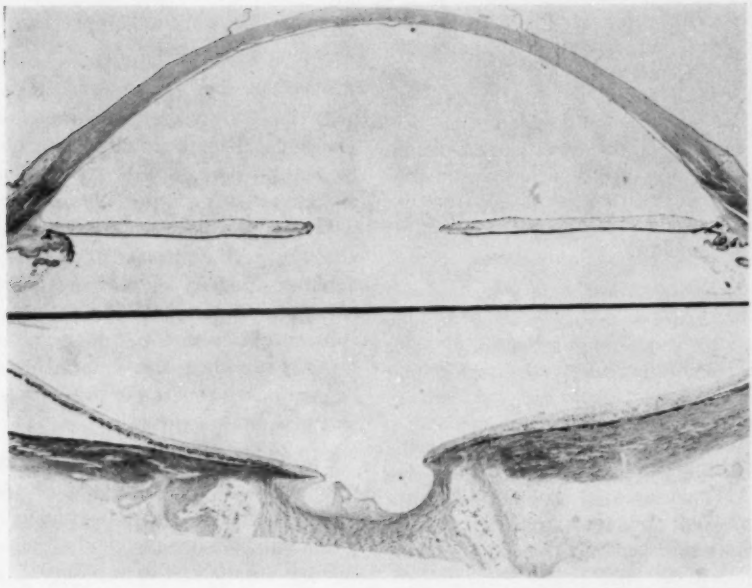

FIG. 2—Chronic simple glaucoma. (Courtesy of the AFIP and Dr. Lorenz Zimmerman.)

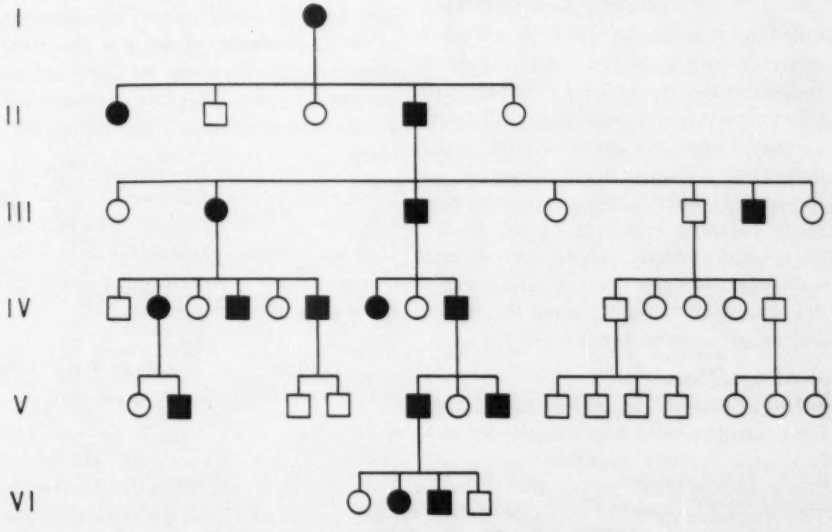

FIG. 3—Dominant pedigree in chronic simple glaucoma.

Hypersecretion of the aqueous humor needs no extended discussion because it accounts for less than one per cent of all cases. In this variety, the angle is open, the outflow is normal, and the reason for the elevation of the intraocular pressure, which may be constant or intermittent, is an apparent excess of production of aqueous over the normal amount.

Hereditary Factor

The history should always include questions concerning the family, since there is an increasing realization that chronic simple glaucoma can run in families. The history of glaucoma in relatives increases the chances that the patient himself has the disease, and vice versa. The reported familial incidence varies from as low as 3 or 4 per cent to as high as 50 per cent (fig. 3).

The relatives of a patient with glaucoma constitute a group in which there is likely to be a high incidence of unrealized and undiagnosed disease. In studies of several families a P_O/C ratio over 100 after drinking water has been noted in some members before any other evidence of glaucoma was apparent. Subsequently, spontaneous impairment of outflow facility occurred. Still later, elevated intraocular pressure, and finally damage to the optic nerve appeared. As these and other observations show a study of other members of the family of a glaucomatous patient affords not only opportunities for detecting early defects but for learning about the stages and progression of the disease.

Previous History

In early cases, in which the outlook for control is most hopeful, the history is usually entirely negative because of the insidious character of the disease. The diagnosis is most often made because the patient consults the ophthalmologist for some other purpose, such as a routine refraction.

Clinical Picture

In the early stages of chronic simple glaucoma, the transition from a normal to a pathologic state is practically imperceptible. In fact, the only abnormality which may be demonstrated is a slight elevation of the intraocular tension, and a reduced facility of outflow. This will pass unnoticed unless the patient consults an ophthalmologist for some other cause. Even then, the abnormality may be overlooked unless the pressure is determined by tonometry.

External and slit lamp examination usually reveal no abnormalities. Aside from tonometric and tonographic findings, ophthalmoscopic and perimetric changes are the first to be observed. Early optic disc changes are often impossible to distinguish from physiologic excavation. Cupping is first noted at the temporal edge of the disc with a bend of the vessels at the edge. As the disease progresses, the typical picture is a deep cup with an overhanging margin and nasal displacement of vessels. At this stage the patient may note the loss of nasal field or the constriction of his visual field.

When the stage of absolute glaucoma is reached, the eye is usually pale and painless as well as blind. Vascular occlusions in such eyes may result in rubeosis iridis and hemorrhagic, painful episodes of acute pressure rises.

QUESTION: *Can a patient have both simple and angle-closure glaucoma?*

DR. SHAFFER: Yes, it is perfectly possible to have a combined mechanism operating in an eye. This can be the obvious one in which the patient has simple glaucoma but also was endowed by his

parents with shallow chambers and narrow angles. It is possible for these narrowed angles to close, producing an acute glaucoma. Iridectomy will relieve the acute episode, but the patient will still have chronic simple glaucoma.

A combined mechanism can also occur in an eye which has had angle closure which was relieved by surgical intervention. The period of angle closure can result in damage to the permeability of the trabecular meshwork; therefore, a form of chronic open-angle glaucoma remains.

QUESTION: *Can halos be a presenting symptom in chronic simple glaucoma?*

DR. MORRISON: The answer in the most part is *no*. The typical halo of glaucoma is due to edema of the cornea induced by an elevated tension. The abrupt marked rise in tension which accompanies angle closure and secondary glaucoma accounts for the relative frequency of a complaint from the patient with one of these types of glaucoma that he sees halos. There is, however, a great deal of individual variation in corneal integrity, with some corneas becoming edematous at a relatively low tension. This infrequent individual response to even a slightly elevated tension accounts for the halo that is occasionally a presenting symptom in simple glaucoma. The possibility of other changes in the media producing a type of halo must be borne in mind.

QUESTION: *When should we suspect the presence of hypersecretion glaucoma?*

DR. BECKER: Hypersecretion glaucoma is a rare condition in which an apparently increased rate of production of aqueous humor elevates intraocular pressure in spite of reasonably normal outflow facility values. It should be suspected in patients with open angles who demonstrate intermittent elevations of intraocular pressure to the mid twenties or low thirties. It is more frequent in females 40 to 60 years of age and is often associated with neurogenic hypertension. The response of the pressure elevations to miotic therapy is not as dramatic as in those eyes with chronic simple glaucoma and reduced outflow facility. The clinical diagnosis of hypersecretion glaucoma is best made by the tonographic finding of normal outflow facility when the intraocular pressure is elevated. An abnormally high scleral rigidity, angle closure, and tonographic artifacts must be ruled out. It is obvious that hypersecretion is a relative term, and that even in such eyes, the height of the elevation of intraocular pressure depends upon the capacity of the outflow channels as well as the secretory rate.

QUESTION: *Does the finding of microcornea (less than 10 mm.) increase the probability of angle-closure glaucoma?*

DR. HAIK: Whether the finding of microcornea of less than 10 mm. should arouse the suspicion of possible future glaucoma depends upon the type of angle present. If the angle is wide open, the probability is that glaucoma will not develop; if the angle is narrow, the chances are that the angle-closure type of glaucoma may develop, usually in the second or third decade of life, but sometimes earlier.

QUESTION: *What is the significance of retinal vein occlusion in the diagnosis of glaucoma?*

DR. BECKER: The finding of a vein occlusion should suggest the presence of pre-existing chronic simple glaucoma.

TABLE I

CONTRALATERAL CHRONIC SIMPLE GLAUCOMA
(CONSECUTIVE UNILATERAL SECONDARY GLAUCOMA)

REFERRAL DIAGNOSIS	NO. PATIENTS	CHRONIC SIMPLE GLAUCOMA OPPOSITE EYE	
		NO.	%
Hemorrhagic glaucoma (vein occlusion)	18	14	78
Other unilateral secondary glaucoma	88	4*	5

*1 traumatic, 1 uveitis, 2 aphakic

Most important is the often neglected consideration of the opposite eye. This may be the only seeing eye in an individual with hemorrhagic glaucoma (table I). In a series of 18 consecutive cases of unilateral hemorrhagic glaucoma referred to one tonography laboratory, 14 (78 per cent) had evidence of impaired outflow in the contralateral "normal" eye. Of a control series of 88 consecutive patients with other types of unilateral secondary glaucoma, only 4 (5 per cent) had contralateral chronic simple glaucoma. The presence of vein occlusion should lead to exhaustive studies for evidence of chronic simple glaucoma in both the involved and contralateral eye.

III. *Gonioscopy, Ophthalmoscopy and Perimetry*

ROBERT N. SHAFFER, M.D.
SAN FRANCISCO, CALIFORNIA

GONIOSCOPY

The importance of accurate gonioscopy becomes obvious when one considers that the primary glaucomas are divided into angle-closure and simple glaucoma by gonioscopic observation. Whether one chooses indirect gonioscopic lenses, like the Allen-Thorpe, the Zeiss, or the Goldmann lenses, or direct gonioscopy with the Koeppe lens, enough gonioscopy must be done by one method to be familiar with the normal variations as seen by that method.

The indirect lenses have the advantage of convenience. The patient can be examined at the slit lamp with no extra equipment and without changing position. When the greatest accuracy is needed in a narrow angle eye, many gonioscopists prefer the Koeppe lens with good illumination and a supported microscope giving at least 20× magnification. Either method provides adequate visualization of wide open angles.

Gonioscopy helps separate simple glaucoma from angle-closure and secondary types. Since the primary glaucomas are bilateral, the observation of a narrow angle in one eye and a wide angle in the other is diagnostic of some secondary mechanism.

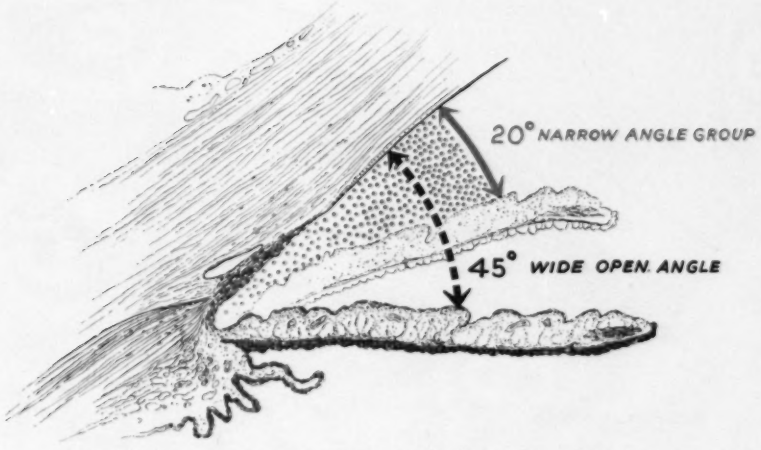

FIG. 4—Wide open angles, 20 to 45 degrees. Narrow angles, 0 to 20 degrees.

The widest angles are characteristically seen in myopia and aphakia. Such eyes have deep angle chambers and a flat iris plane which makes an angle of about 45 degrees with the trabecular surface. As the chamber depth shallows, the angle narrows. There is both increasing relative pupillary block and increasing danger of angle closure as the angle becomes smaller than 20 degrees (fig. 4).

At the present time there are two methods of classifying angles by number. Unfortunately, a narrow angle in one classification is "Grade 1" in the other, "Grade 4." To avoid this confusion an anatomic classification is suggested to replace the number systems (table II).

It is obvious that these categories are not clean cut. Just as there is no sharp, neat point at which day changes to night, the divisions merge into one another, and therefore the usefulness of this, or any other, classification will depend on the skill and experience of the observer in judging which angles are capable of occlusion (figs. 5-12).

TABLE II

ANGLE CLASSIFICATION

CLASSIFICATION	CLINICAL INTERPRETATION
1. Wide open angle	Closure improbable or impossible
2. Narrow angle, moderate	Closure possible
3. Narrow angle, extreme	Closure probable, eventually
4. Narrow angle, closed (complete or partial)	Angle closure present

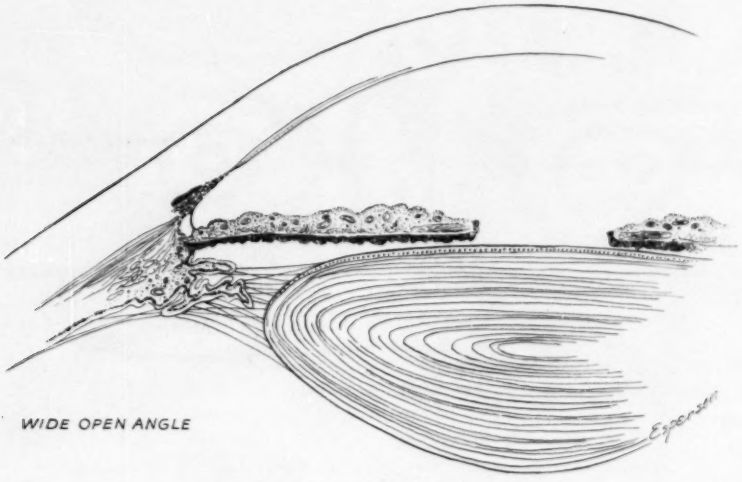

FIG. 5—Diagram of wide open angle.

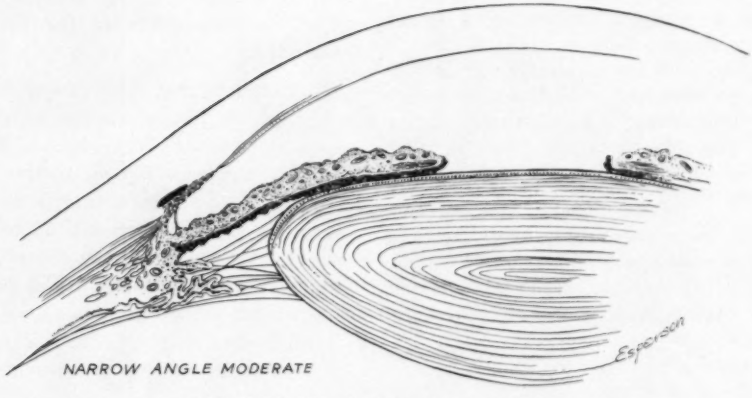

FIG. 6—Diagram of moderately narrow angle.

A common gonioscopic mistake is in diagnosing an angle as closed when iris processes are covering the angle recess and lower trabeculae. Iris processes are continuous with the anterior layer of the iris. They wrap around the angle recess, following closely the contour of the concavity of the anterior ciliary body, occasionally bridging the recess, seldom running much above the scleral spur. Synechias, on the contrary, are broader. The base of the iris butts into the trabeculae, concealing the angle landmarks below the abnormal attachment point of iris to trabecular meshwork. Synechias are common after attacks of angle-

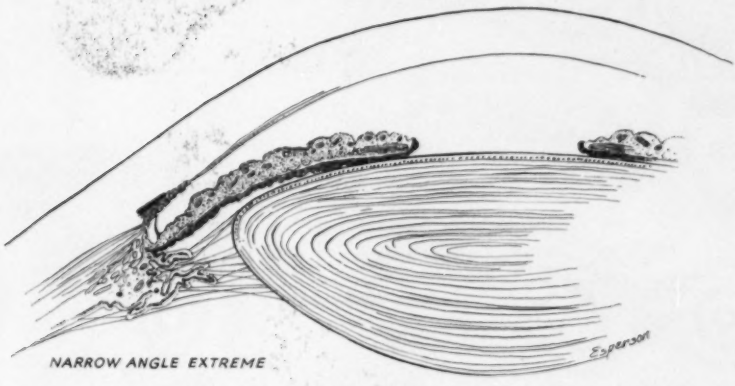

FIG. 7—Diagram of extremely narrow angle.

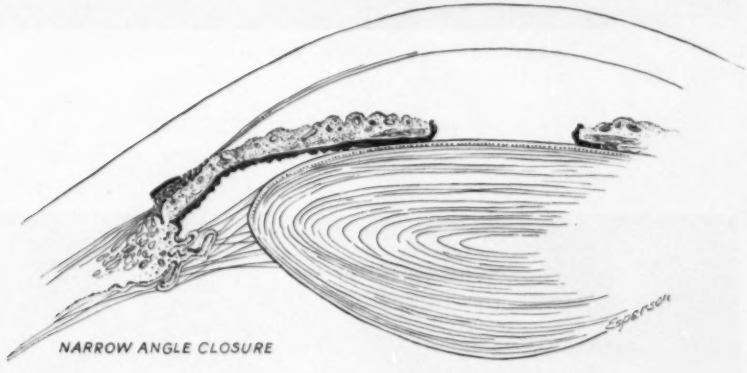

FIG. 8—Diagram of angle closure.

closure glaucoma, but are never seen in simple glaucoma not surgically treated, except in the terminal phase of absolute glaucoma. The eye then becomes congested, and synechias can form which are similar to the irregular peripheral anterior synechias of iritis (fig. 13-16).

In the narrow angle group of cases, gonioscopy is of utmost value in diagnosis, in understanding the mechanism of angle closure, and in evaluating therapy, It is insufficiently realized how rare a shallow chamber really is. In 3000 consecutive refraction cases, only 10 per cent could be classified as having moderately shallow chambers and only 2 per cent as having extremely shallow chambers. Even in this small group not all of the angles were correspondingly narrowed. The observation of a shallow chamber should alert the examiner to the potentiality of angle closure and obligate him to study the angles gonioscopi-

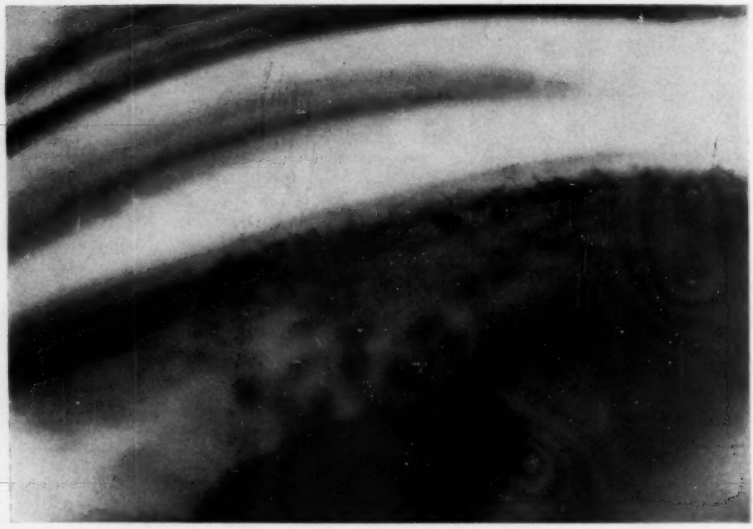

FIG. 9—Gonioscopy of wide open angle. Blood in Schlemm's canal.

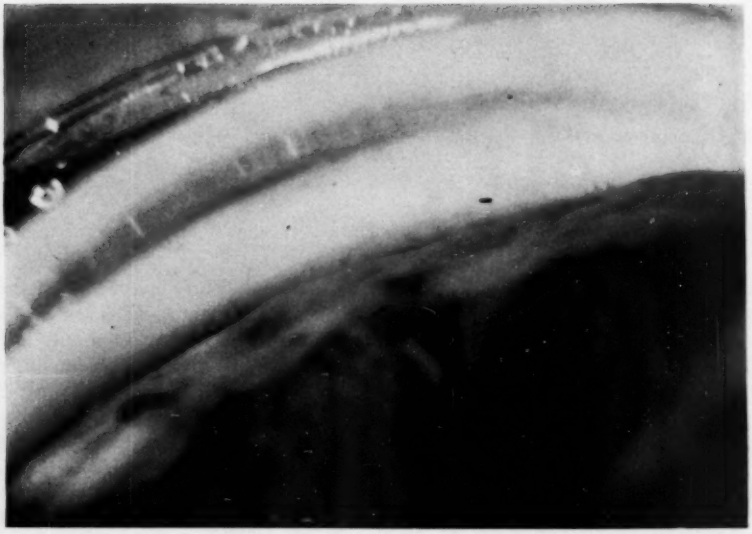

FIG. 10—Gonioscopy of moderately narrow angle. Patient's father had acute glaucoma.

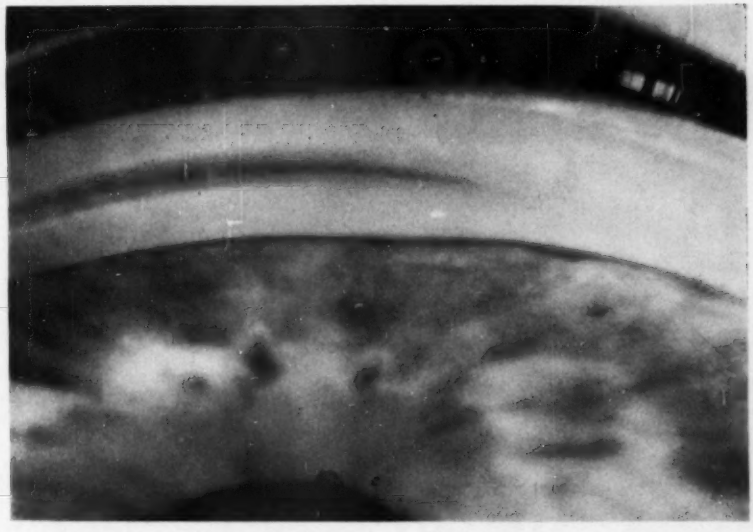

FIG. 11—Gonioscopy of extremely narrow angle.

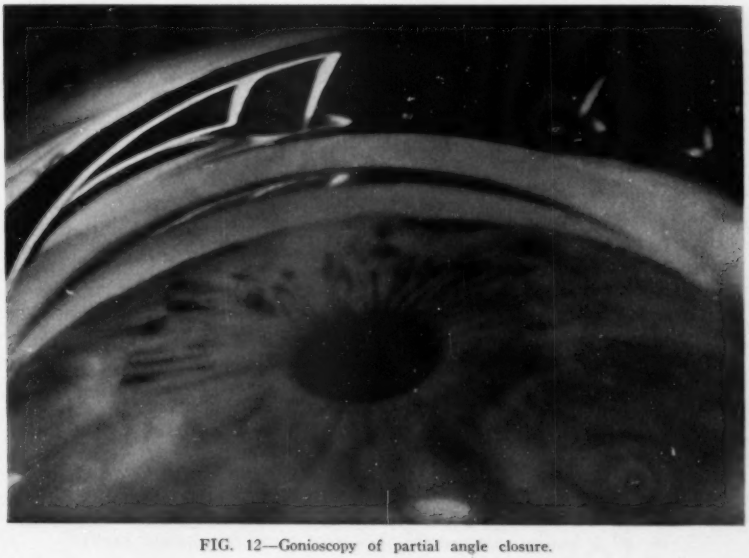

FIG. 12—Gonioscopy of partial angle closure.

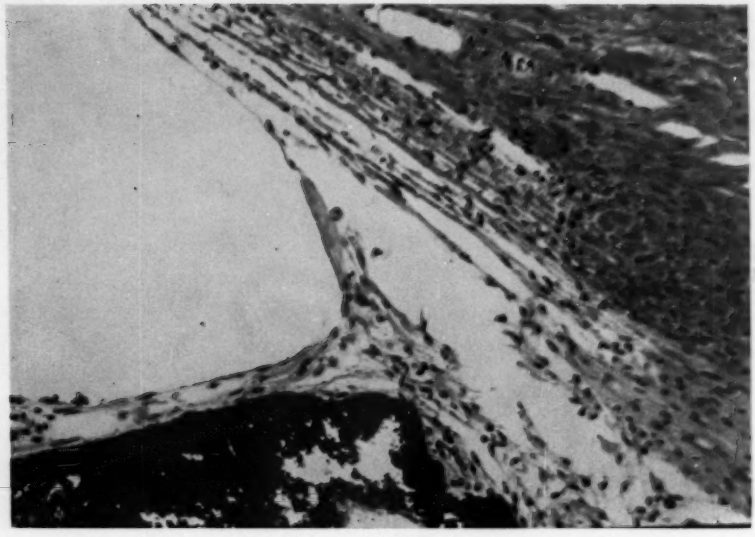

FIG. 13—Microscopy of an iris process.

FIG. 14—Microscopy of a peripheral anterior synechia. (Zimmerman, AFIP)

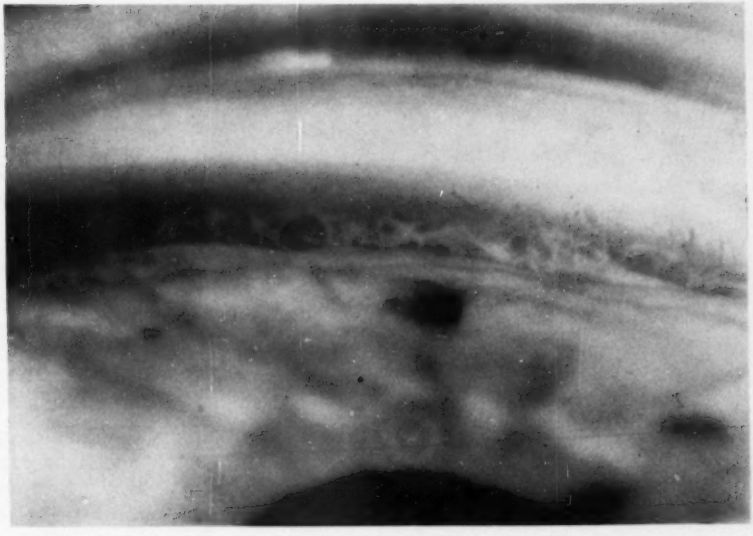

FIG. 15—Gonioscopy of iris processes.

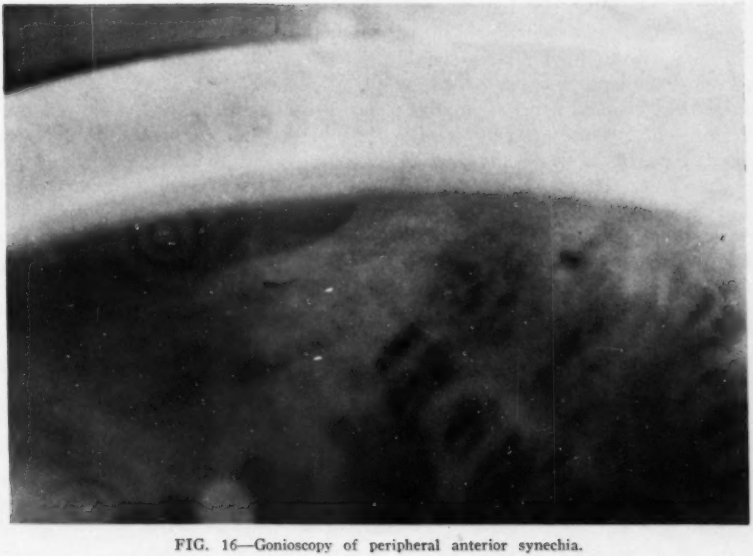

FIG. 16—Gonioscopy of peripheral anterior synechia.

cally. With narrow angles, symptoms of occasional blurred vision, halos, discomfort, or pain are of major diagnostic importance. Similar symptoms are rare in eyes with wide angles.

Gonioscopy may be of great help in proving potential angle closure in a narrow angle eye which has had no pressure rise with dark room or mydriatic tests. The patient is gonioscoped in a darkened room, which permits the pupil to dilate. Using a shielded Barkan illuminator with the Koeppe lens, or a small slit beam with an indirect gonioscopic lens, it is often possible to see the angle close in part or all of its circumference after 30 to 60 seconds. Enlarging the beam to include the pupil, or shining a light in the opposite pupil to produce a consensual constriction of the pupil, causes the angle to open. Such an eye usually shows decreased facility of outflow with tonography in the dark, due to the areas of angle closure.

The narrow angle most likely to be missed is that in an eye with a plateau iris. Such an eye does not have a very shallow central anterior chamber, but a critically narrowed angle. This should be noted by slit lamp biomicroscopy or by gonioscopy. Usually relative pupillary block is present in these eyes and iridectomy is as curative as in eyes with shallower chambers. Occasionally such an eye will have an insignificant pupillary block and merely an anatomically narrowed angle which can be blocked by the iris if the pupil dilates. Since little aqueous is trapped behind this iris, iridectomy does not widen the angle significantly, and dilation bunches up the peripheral iris into the angle, resulting in angle closure.

In chronic angle closure there is iris apposition to trabeculae in most of the angle area, resulting in decreased outflow and raised base pressure. Gonioscopically there is usually a small area of open angle with complete angle closure elsewhere. In some of these eyes, iris is merely being held against the trabeculae by the physiologic iris bombé and iridectomy may still be curative. More of them have permanent synechias, and some form of filtering procedure is needed in addition to the iridectomy. Unfortunately, this carries with it an added risk of the dreaded surgical complication of malignant glaucoma. This underlines the maxim that the time to cure angle closure is by iridectomy before synechias form (figs. 17 and 18).

OPTIC DISC AND FIELD CHANGES

In simple glaucoma, ophthalmoscopy, perimetry, tonometry and tonography are the keys to diagnosis and treatment. The most salient feature of the follow-up examination is the presence or absence of deterioration of the optic disc and of the field of vision. The initial examination must therefore include an accurate disc description, and reliable peripheral and central field studies. Central fields are repeated every one to six months, depending upon the status of control.

Optic Disc

Disc changes may be followed by the use of diagrams. These show undermining by a solid line and a sloped edge of a cup by a dotted line. At a glance one can see how much relatively normal nerve tissue is present. The entering position of the blood vessels can be indicated. A note should be added if atrophy is present. There is little doubt that a pink disc without cupping resists pressure elevations far better than a disc with a large cup. We have seen progression of cupping, particularly in young individuals with little change in field. Once the field starts to fail in an eye with an excavated disc, deterioration is usually rapid if tension is not kept under particularly rigid control (figs. 19-24).

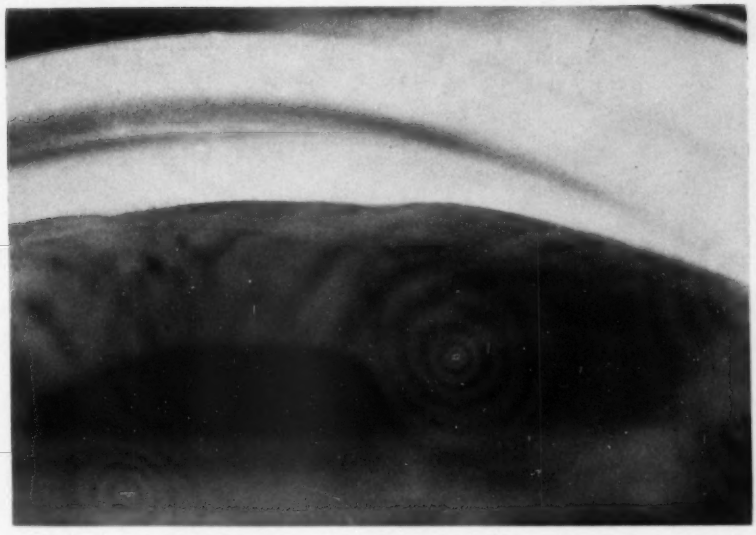

FIG. 17—Gonioscopy of preoperative angle closure glaucoma.

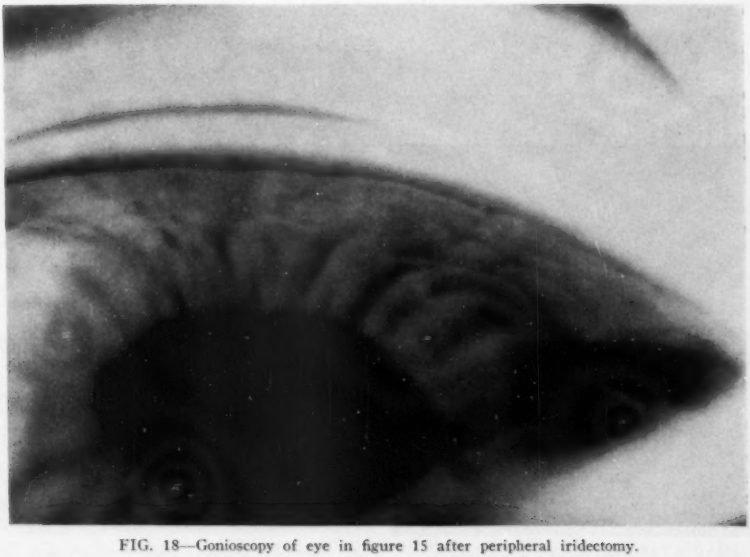

FIG. 18—Gonioscopy of eye in figure 15 after peripheral iridectomy.

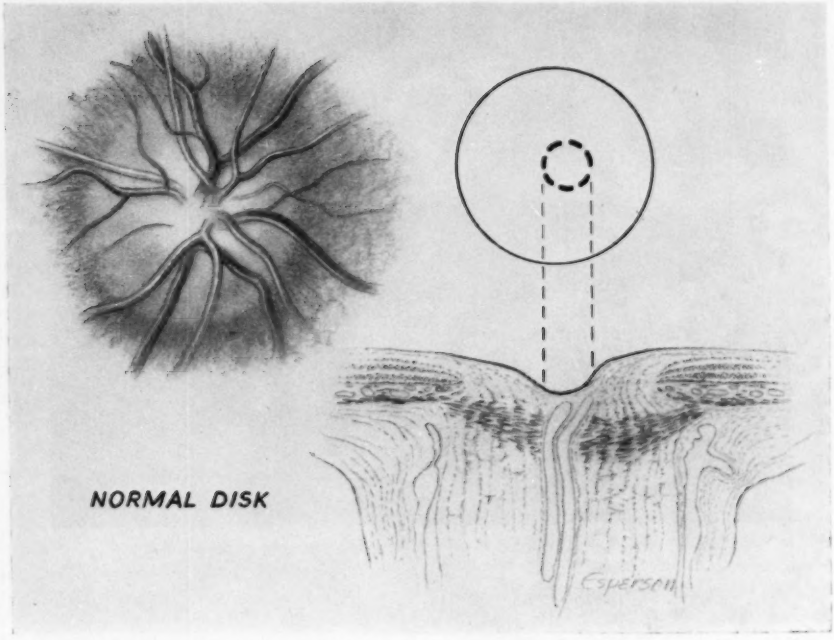

FIG. 19—Diagram of normal disc.

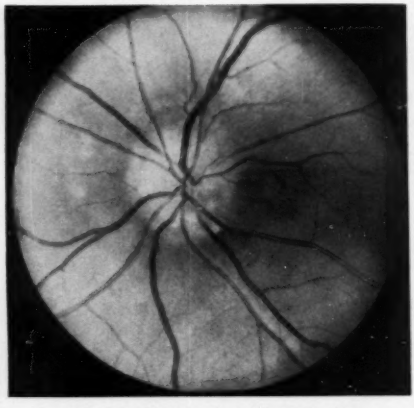

FIG. 20—Photograph of normal disc.

Field

Field changes in simple glaucoma are diagnostic. As you know, the basic impairment is the nerve fiber bundle defect. Changes in the field correspond surprisingly well with the position of excavation of the disc. Prediction of anticipated field changes is an interesting office exercise for the ophthalmologist (figs. 25-27).

The earliest alteration of the field is an enlargement of the blindspot, usually in a vertical direction. True baring of the blindspot is the first phase of an arcuate scotoma. The full-blown Bjer-

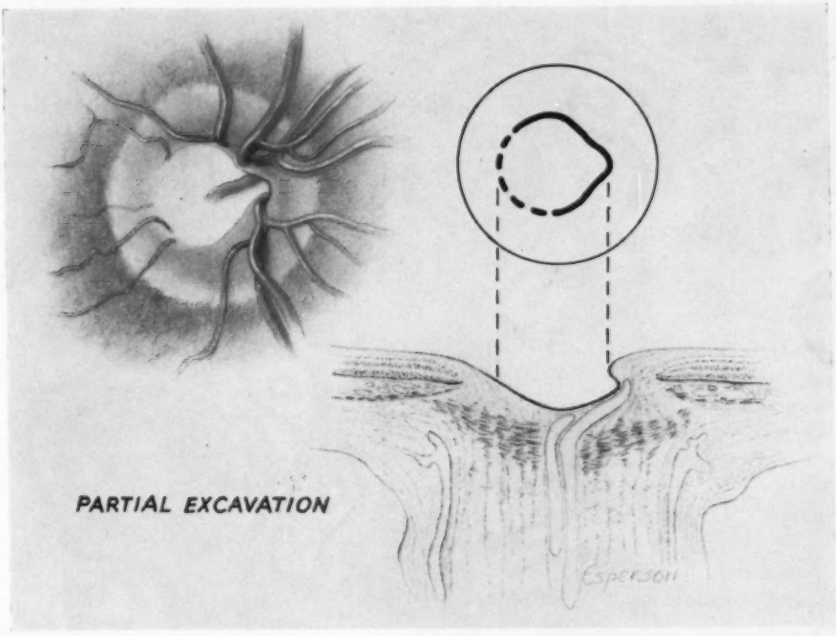

FIG. 21—Diagram of moderately cupped disc.

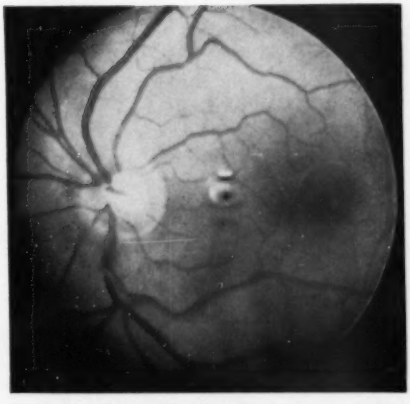

FIG. 22—Photograph of moderately cupped disc.

rum's scotoma may involve the upper field, the lower field, or both. Depression of the peripheral field is especially marked nasally, and forms a nasal step where it joins the arcuate scotoma. A small central island and a temporal crescent of vision tend to be the last portion of the field to be lost in the inexorable destruction of uncontrolled glaucoma. Complete tension control can interrupt this progression at any stage, but the earlier that tension is controlled, the better the prognosis.

Sometimes an apparent failure in the fields may be unrelated to the glaucoma and is therefore not a reason for more

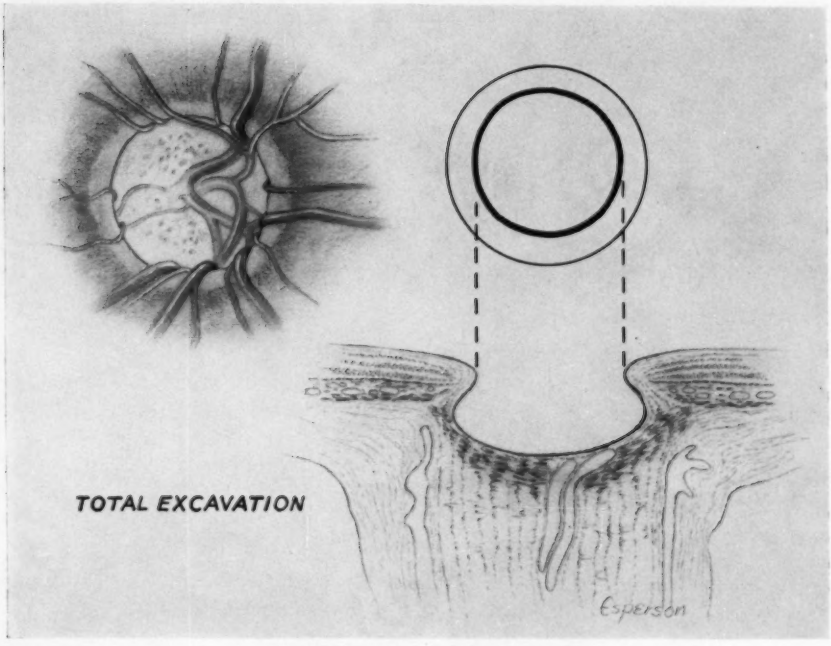

FIG. 23—Diagram of severely cupped disc.

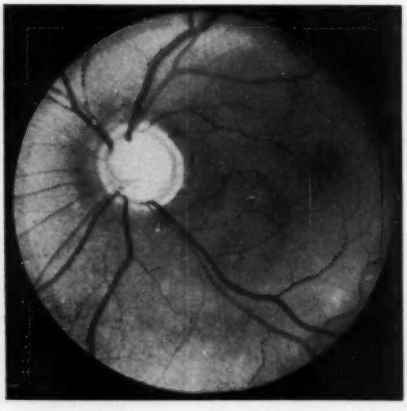

FIG. 24—Photograph of severely cupped disc.

intensive or radical therapy. Anything which decreases the intensity of the stimulation of the standard testing target will exaggerate an existing field defect. Such transient effects as that of a miotic given shortly before the field test, or a lid drooping half-way over the pupil, or decrease in lighting may cause apparent field deterioration. However, by far the most common artifact is that failure in field caused by the development of cataract. Dilating the pupil will result in restoration of the original field, unless the cataract is too dense. In this case the reason for the change is obvious (fig. 28). True progression in field defect or increase in cupping on maximal

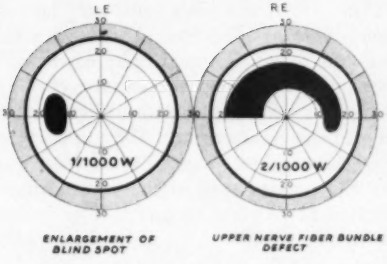

FIG. 25—Early field defects in glaucoma.

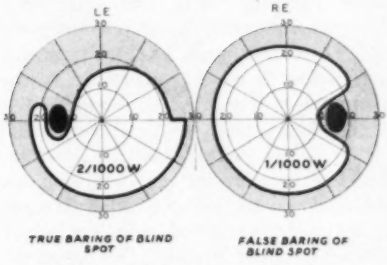

FIG. 26—Early field defects in glaucoma.

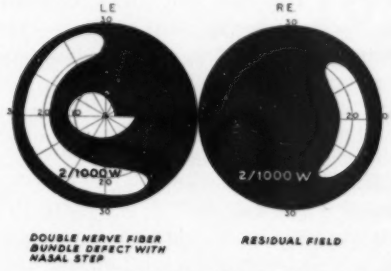

FIG. 27—Late field defects in glaucoma.

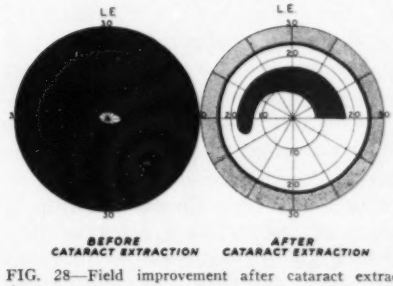

FIG. 28—Field improvement after cataract extraction.

medical therapy is reason for surgical intervention. Too often the ophthalmic surgeon places complete reliance upon a technician's field examination. Fields should be checked periodically by the doctor, no matter how sure he may be of his technician's accuracy. If this is not done, crucial therapeutic decisions may be based upon unreliable information.

QUESTION: *Should gonioscopy be a routine part of the examination of patients seen in the office?*

DR. MORRISON: Theoretically gonioscopy should be carried out on the eyes of patients old enough to cooperate for such an examination and on eyes that can withstand such a procedure. Routine gonioscopy, however, is often beyond the time allowance of the average clinical ophthalmologist. One must therefore decide what test to carry out for each individual eye condition and not run the gamut of all known eye procedures. Gonioscopy should certainly be done on each eye suspected of having glaucoma. The finding of a shallow anterior chamber, determined either by flashlight or with the narrow beam of the slit lamp, demands further detailed examination of the angle.

QUESTION: *What is the best goniolens for office use?*

DR. BECKER: I prefer the Zeiss or similar gonioprism used with the slit lamp for routine examination because of its ease of application and ready availability. The convenience offers the opportunity to do gonioscopy on all patients and in an upright position. If questions of detail arise, or in the examination of infants, use is made of Koepp-type lenses.

DR. SHAFFER: There is no doubt in my mind but that one can obtain a better view of an angle with a Koeppe lens. Only in extremely narrow angles does this become of critical importance, but of course this is just the type of case in which the knowledge is most essential.

QUESTION: *Are anterior synechias ever seen in early chronic simple glaucoma?*

DR. SHAFFER: No. There is no mechanism by which the iris can be pushed or pulled against the trabecular meshwork until late in the course of simple glaucoma, when congestion can supervene.

QUESTION: *What is the relative value of tangent screen versus perimetry in glaucoma management?*

DR. HAIK: Except for the Goldmann perimeter and others of this type, there is no doubt of the superiority of the tangent screen over the perimeter. The patient's progress can be followed more easily and more accurately with the screen, which picks up errors extending out to 30 from the point of fixation. The screen, of course, is simply a higher magnification of the same 30 degree zone on the perimeter.

One special precaution is necessary in the use of the tangent screen: If at any time a scotoma picked up on the screen extends beyond 30 degrees, perimetry should be carried out to depict the scotoma correctly and to detect any additional loss of the field of vision. Adjunct study with the perimeter is then obligatory.

QUESTION: *Why is glaucoma sometimes missed in myopia?*

DR. SHAFFER: Professor Goldmann has emphasized that the cupping of the disc is not caused by the bowing back of the cribriform plate until very late in the course of glaucoma. When present, it is due to cavernous atrophy of the optic nerve. The glaucomatous cup is caused by the atrophy and disappearance of the nerve fibers and the supporting glial tissue, thus increasing the size, but not the actual depth of the cup. An important application of this fact is found in myopia, in which the cribriform plate is only half the normal distance from the retina. Therefore, the short distance between vitreous cavity and cribriform plate gives no room for an obvious glaucomatous cup to form. Everything seems to conspire to conceal glaucoma in the myopic eye. The myopic cupped disc merely looks atrophic, and the usual myopic conus further conceals the atrophy. Enlargement of the blindspot can be blamed on the myopic conus; irregular field defects can be blamed on foci of myopic atrophy. Finally, the decreased scleral rigidity gives falsely low Schiøtz pressure readings. For these reasons, the astute clinician will be doubly on guard in dealing with possible glaucoma in myopia.

QUESTION: *What is the value of the Harrington-Flocks screen device for early detection of glaucoma field defects?*

DR. HAIK: In the opinion of the physicians who devised this technique, the device fills the need for a rapid and simple screening method for examining the visual fields in industrial workers and applicants for drivers' licenses and in mass examinations of other personnel. They do not consider it a substitute for either the tangent screen or the perimeter. It does not cover the full field as the perimeter does, since it is set up to encompass only a 25-degree radius. It is of no value in aphakic patients, because they respond as if they had a field loss.

If the test is used, it must be remembered that it produces many false positives and it may be necessary to repeat it one or more times.

QUESTION: *Can the pupil be dilated with safety for fundus examination after peripheral iridectomy for angle-closure glaucoma?*

DR. SHAFFER: Yes, unless one has the misfortune to dilate in one of the very rare cases of plateau iris without relative pupillary block. With this exception, dilation is completely safe after a patent iridectomy has been performed. We have seen cases after iridectomy in which only the iris stroma has been removed, leaving an intact pigment epithelium, and no patent iridectomy actually existed. Also an iridectomy may be closed by fibrous tissue or by adhesions either to the corneal incision or to the lens. If no opening is present between posterior and anterior chamber, the potentiality for angle closure still exists.

IV. *Tonometry, Tonography and Provocative Tests in the Management of the Glaucomas*

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In the use of tonometry and tonography it is important to emphasize that the methods available are subject to errors of instrumentation, calibration, technique, patient cooperation, and so forth. Although some of these may be corrected or avoided, conclusions should not be drawn hastily from single determinations. Repeated consistent values provide useful information about the status of the eye. As with other laboratory procedures, when taken in conjunction with the history and clinical findings, the data obtained can be of enormous assistance to the ophthalmologist in the diagnosis and evaluation of the therapy of glaucoma.

A. DIAGNOSIS

1. *Angle-closure Glaucoma*

The suspicion of a diagnosis of angle-closure glaucoma is raised by history and gonioscopic findings. The best means of provoking angle closure is by pupillary dilatation. This may be accomplished either by the administration of eucatropine hydrochloride (Euphthalmine) 5 per cent or subjecting the patient to a dark room for 60 to 90 minutes. When mydriatics are used, it is highly advisable to dilate the pupil of only one eye. After the test is over, miotics should be administered until the pupil is constricted. Many eyes with narrow angles apparently occlude on pupillary dilatation but do not experience a pressure rise (table III). Thus, although less than one half of a series of 48 eyes with a proved capacity for angle closure could be detected by an 8 mm. rise in intraocular pressure, and two thirds of the series rose to pressures over 20 mm. Hg, 83 per cent of these same eyes could be discovered by a 25 per cent, or greater, reduction in tonographic outflow facility. Similarly, in 42

TABLE III

MYDRIATIC PROVOCATIVE TEST
(INITIAL P_o UNDER 20 MM. HG)

GONIOSCOPY	INCREASE P_o (%)		DECREASE C (%) 25% +
	8 + MM. HG	OVER 20	
Narrow angle			
Closure history (48 eyes)	46	67	83
No closure history (42 eyes)	10	24	38
Total—Narrow angle (90 eyes)	29	47	62
Normal angle (24 eyes)	0	13	0

P_o = intraocular pressure C = outflow facility

eyes with narrow angle but no history of angle closure, 10 per cent demonstrated an 8 mm. rise in intraocular pressure, 24 per cent a pressure over 20 mm. Hg, and 38 per cent a significant decrease in outflow facility. Twenty-four normal eyes failed to demonstrate 8 mm. rises in intraocular pressure or decreases in outflow facility, but 13 per cent had intraocular pressures over 20 mm. Hg after mydriasis. It must be emphasized that single or even multiple negative provocative tests do not rule out the possibility of subsequent episodes of angle closure. All of us have had the experience of patients developing acute angle closure some time after a negative provocative test. It is clear that all eyes with narrow angles must be followed closely, preferably with repeat provocative testing.

TABLE IV

DIAGNOSIS OF CHRONIC SIMPLE GLAUCOMA

METHOD	GLAUCOMA (188 EYES)	NORMAL (175 EYES)
	%	%
P_o 24 mm. Hg +	39	0
P_o over 20 mm. Hg	64	7
C below 0.20	64	6
After water		
8 mm. Hg + rise (Schiøtz)	28	0
P_o/C over 100	97	1

P_o= intraocular pressure
C = outflow facility

2. *Chronic Simple Glaucoma*

The diagnosis of glaucoma may be suggested by applanation or Schiøtz tonometry. Values greater than 20 mm. Hg by applanation or Schiøtz scale readings below 4.25 with a 5.5 gram weight, or below 6.25 with a 7.5 gram weight, should be considered suspect of glaucoma (table IV). Although some 7 per cent of normal eyes will fall into this category, by such criteria one can detect approximately two thirds of untreated known glaucomas. Similar levels of recognition can be obtained by tonography if outflow facilities below 0.20 are considered suspect. It is recommended that all eyes with pressure readings greater than 20 mm. Hg, or outflow facilities less than 0.20, be subjected to careful further evaluation for glaucoma. It must be re-emphasized that single pressure measurements of 24 mm. Hg or more are found in only some 40 per cent of cases of untreated proved glaucoma.

For eyes with open angles, water-drinking provocative tests are of considerable value. An 8 mm. rise by Schiøtz tonometry in intraocular pressure after drinking water occurs in less than a third of eyes with proved glaucoma. However, the evaluation of tonographic outflow facility as well as intraocular pressure 40 to 45 minutes after water drinking permits the detection of over 90 per cent of such eyes. Adequate data are not yet available as to the long-term follow-up of eyes which are normal except for their resemblance to glaucoma in presenting a P_O/C greater than 100 after water. At present such eyes should be considered potentially glaucomatous and should be followed closely.

B. THERAPY

1. *Angle-closure Glaucoma*

Tonography complements gonioscopy in the decision as to the type of surgery to be done in angle-closure glaucoma. It is generally agreed that if outflow facility is adequate, iridectomy is the procedure of choice. Filtering operations should be reserved for those eyes with extensive anterior synechias and markedly impaired outflow facility (fig. 29). Thus, in a review of a series of angle-closure glaucomas subjected to iridectomy or iridencleisis, the failure rate from iridectomy as an initial procedure was negligibly small in eyes with outflow facility greater than 0.15, but it rose to over 75 per cent in eyes with outflow facility less than 0.10. On the other hand, the prognosis in iridencleisis proved reasonably independent of outflow facility with some 15 to 25 per cent failures at all facility values. Fortunately, iridencleisis proves successful in eyes with completely occluded angles, and is approximately as effective after an iridectomy failure (27 per cent failure rate) as an initial procedure (22 per cent failure rate) (table V). It is, therefore, highly recommended that more iridectomies be done for angle-closure glaucoma and that iridencleisis be reserved for the iridectomy failures.

TABLE V

IRIDENCLEISIS IN ANGLE-CLOSURE GLAUCOMA

	NO. OF EYES	% FAILURES
Primary procedure	82	22
Iridectomy failures	11	27
Iridencleisis failures	16	50
Total	109	27

2. *Chronic Simple Glaucoma*

Various forms of miotic therapy improve outflow facility and lower intraocular pressure. A recent study (table VI) has demonstrated that if intraocular

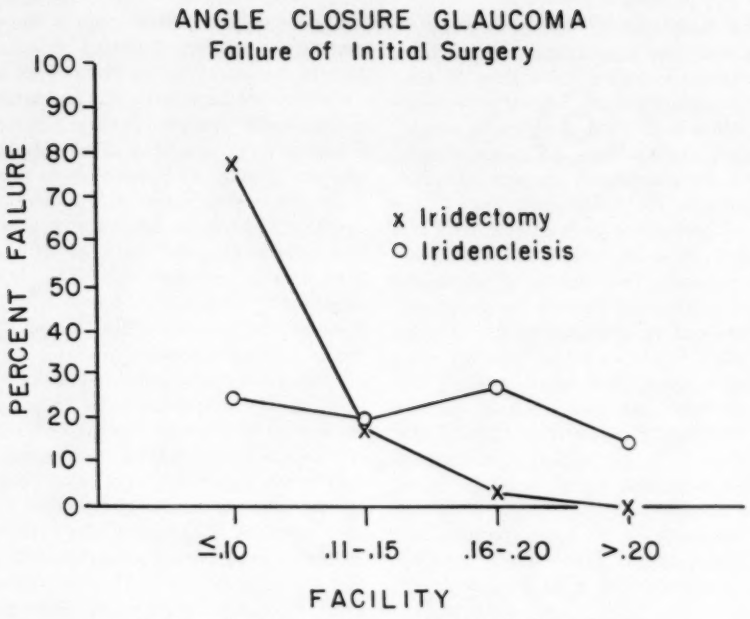

FIG. 29—Angle closure glaucoma. Failure of initial surgery.

pressure was initially at levels of 24 mm. Hg or below on miotic therapy alone, there was, roughly, a 50 per cent chance of continued control over a three-year period. If pressure could be brought to levels below 20 mm. Hg by miotics, the chances of continued successful control for three years improved to approximately 75 per cent. Initial outflow facility values greater than 0.10 on miotic therapy alone assured continued control in two thirds of the eyes. Values greater than 0.15 increased the number of successes to over 80 per cent. In this series, a P_O/C ratio of less than 100 on miotics was associated with continued control in over 90 per cent of the eyes.

It is important to re-emphasize that tonography, when performed carefully and suitably corrected for the individual eye, provides valuable information about the progress and suggestions as to the status of control of glaucoma. This laboratory test can supplement and corroborate other findings, but is not a substitute for good clinical judgment in the handling of the patient. Tonography does not dictate surgical intervention in the absence of progressive field loss.

In eyes treated with epinephrine and carbonic anhydrase inhibitors, intraocular pressure may be further lowered without altering outflow facility. Under these circumstances the criteria for evaluation of prognosis are changed so as to depend less on outflow facility and more on pressure estimations. It appears at present that it is wisest for most eyes to be controlled at intraocular pressure levels less than 20 mm. Hg. This value

TABLE VI

PROGNOSIS CHRONIC SIMPLE GLAUCOMA (MIOTIC THERAPY — 3 YEARS)

INITIAL	NO. EYES	SUCCESSES*	
		NO.	%
$P_o \leqslant 24$	250	135	54
$P_o < 20$	136	100	74
$C > 0.10$	198	129	65
$C > 0.15$	136	111	82
$P_o/C < 100$	115	105	91

*No progression field loss and no pressure over 24 mm. Hg

P_o= intraocular pressure

C = outflow facility

may have to be altered in the individual eye because of variations in the vulnerability of the particular optic nerve to damage at a given pressure level.

Following filtering procedures, outflow facility is usually improved and intraocular pressure lowered. Routine tonography offers the opportunity for the early detection of the failure of a filtering bleb. A progressive decrease in outflow facility in an eye with a successful filtering operation should make the ophthalmologist suspicious of scarring down of the bleb.

QUESTION: *What is the significance of a difference in the ocular tension in the two eyes?*

DR. SHAFFER: A disparity of more than 4 millimeters of mercury between the two eyes should alert the doctor to the possibility of a defect in the outflow mechanism. Such a patient should have repeat tonometry. If the difference is consistent, a thorough glaucoma work-up is indicated.

QUESTION: *What symptoms or findings cause you to take the ocular tension in a young person, or to even consider glaucoma?*

DR. BECKER: I believe intraocular pressure should be measured by applanation or Schiøtz tonometry in all individuals old enough to cooperate. I see no more reason to omit this part of the eye examination than to omit the estimation of visual acuity or the use of the ophthalmoscope or slit lamp. Measurements under anesthesia in the youngest groups are usually confined to those demonstrating corneal clouding or enlargement, cupping of the nerve head, postinflammatory or traumatic scarring, or suggestive elevations of tactile tension.

QUESTION: *Is applanation tonometry useful in routine office practice?*

DR. MORRISON: The applanation tonometer is an accurate, sensitive, easy-to-use instrument rugged enough to be repeatedly employed in office practice. This type of tonometer measures the intraocular pressure uninfluenced by ocular rigidity. If the applanation tonometer is routinely used and eyes with tension readings over 20 are subjected to an intensive glaucoma work-up, a number of patients with previously unsuspected glaucoma will be detected. The coefficient of ocular rigidity may be determined by comparing the reading obtained by applanation with a subsequent Schiøtz reading. The determination of ocular rigidity is important to tonography and is a means of finding the Schiøtz scale reading with a certain weight, below which nerve damage is likely to occur.

QUESTION: *Should a busy ophthalmologist introduce tonography into his office*

routine or should selected patients be sent to a clinic or teaching center for this procedure?

DR. HAIK: Tonography is a procedure which is usually reserved for laboratories and not used in the average ophthalmologist's office because of the inherent technical difficulties and sources of error associated with it. On the other hand, if an ophthalmologist has reliable equipment and a competent technician, and if he is willing to take the necessary time, he can develop in his office reasonably satisfactory tonographic arrangements which would be of value in glaucoma management. Generally speaking, however, it is best that tonography, like electroencephalography, be carried out in hospitals or clinics equipped with reliable equipment and staffed with competent, highly trained technicians.

QUESTION: *Of what value are the diurnal tension variations in the office management of glaucoma?*

DR. BECKER: Diurnal variations in intraocular pressure are largely dependent upon alterations in secretory activity. In eyes with decreased and less flexible outflow facility, variations in secretory rate will result in much greater changes in intraocular pressure than in eyes with more adequate and easily varied outflow capacity. Therefore, diurnal variations are greater in the glaucomatous eye than in the normal. Furthermore, normalization of outflow facility by miotics tends to minimize diurnal variations in intraocular pressure even in glaucomatous eyes. Since many patients present their peaks of intraocular pressure before or after office hours, diurnal measurements supplement tonography in the detection of glaucoma. In addition they offer a rational basis for choice of therapy as well as its time and frequency of administration. They provide a far better criteria for control than single pressure measurements.

DR. HAIK: Variations in tension may be checked by having the patient come to the office at frequent intervals over as wide a spread of time as is feasible during working hours. A 24-hour curve should be made in any suspected case in which the diagnosis cannot be confirmed by other means. Tonography is superior under proper conditions, but the study of diurnal tension variations is an acceptable substitute if tonography is not available.

The information obtained by a study of the diurnal variation curve has therapeutic as well as diagnostic value. A glance at the curve indicates at once at what time of day miotics are most useful.

QUESTION: *Is there any practical way of obtaining diurnal tension curves if residents are not available?*

DR. SHAFFER: In our office the tensions are taken in the office during the day. The patient is hospitalized at a reduced charge just for overnight and our office nurse stays at the hospital, takes tensions every two hours, and is paid for her overtime. If this is impractical, the doctor should take the responsibility of taking tensions, at least at midnight and at seven o'clock in the morning.

QUESTION: *Discuss scleral rigidity, its determination and interpretation in glaucoma management.*

DR. BECKER: The scleral rigidity coefficient is an arbitrary term expressing the mathematical relationship between the volume of the ocular contents and the intraocular pressure. It quantitates the resistance to stretch offered by the

ocular coats when subjected to pressure within the eye. Estimates of scleral rigidity may be approximated by Schiøtz tonometry using two different weights, but is best measured at present by an applanation and Schiøtz reading.

If measurements of intraocular pressure are made by applanation tonometry, the changes induced by the procedure are so slight that scleral rigidity plays little, if any, role in the determination. However, in the use of Schiøtz tonometry the intraocular pressure is raised by some 15 to 25 mm. Hg by the application of the tonometer. Since the calibration tables assume an average value for the scleral rigidity coefficient, deviations from such average values in individual eyes will lead to false estimates of the true intraocular pressure.

A low scleral rigidity coefficient, such as is found in some myopic or thyrotropic exophthalmic eyes, or in some eyes following the consumption of a liter of water, will result in an underestimation of intraocular pressure by Schiøtz tonometry with one weight. This may lead to the failure to recognize glaucoma or to the false assumption that it is adequately controlled. Some operative procedures and, in certain glaucomatous eyes, the administration of stronger miotics also result in lowering the scleral rigidity coefficient and in similar false assurances as to glaucoma control.

In tonography, a lower scleral rigidity coefficient than the assumed normal will result in a falsely flat tracing in addition to the low estimate of intraocular pressure. If no corrections are made, such findings simulate glaucoma with hyposecretion, or controlled pressure but inadequate outflow facility. Fortunately, on an empirical basis, these tonographic findings suggest close follow-up and further study, even in the absence of scleral rigidity measurements.

A scleral rigidity coefficient higher than the assumed average will lead to falsely high estimates of intraocular pressure by Schiøtz tonometry. This may result in a misdiagnosis of glaucoma or falsely suggest its poor status of control. The uncorrected tonographic tracings on such eyes are steep, thus simulating hypersecretion glaucoma. The differential diagnosis between elevated scleral rigidity and hypersecretion glaucoma can only be made by estimation of scleral rigidity for the given eye.

QUESTION: *Explain the occurrence of angle-closure glaucoma in eyes previously having a negative mydriatic or dark-room test.*

DR. SHAFFER: The principal mechanism involved in production of angle-closure glaucoma is the increased collection of aqueous behind the iris due to the relative pupillary block. The pupillary block is increased by a miotic pupil and is decreased by dilating the pupil. If the pupillary block is broken by pupillary dilatation before angle closure can occur, the dark-room or the mydriatic test may be negative. The eye with potential angle closure is never safe; it may avoid tension elevation at one time, and at another time precipitate an acute attack under seemingly identical conditions.

QUESTION: *What are the symptoms and findings which arouse suspicion of low tension glaucoma at the preliminary examination? How do you proceed to make the diagnosis and manage?*

DR. BECKER: Low tension glaucoma may be defined as the pathologic condition of any eye with an estimate of intraocular pressure within normal limits and evidence of glaucomatous cupping or field loss. Under this category one

must consider glaucoma with low scleral rigidity, glaucoma with hyposecretion, reversible or cured glaucoma, and optic nerve defects.

Glaucomatous eyes with lower than average scleral rigidity may simulate the picture of low tension glaucoma if Schiøtz measurements with only one weight are made. Applanation measurements or other estimates of scleral rigidity reveal the true status of these eyes and their therapeutic needs.

In most instances of so-called "low tension" glaucoma, tonography reveals that the eye has impaired outflow facility with a decreased rate of secretion of aqueous humor. Such hyposecretion is often intermittent so that diurnal measurements of intraocular pressure or the administration of water may reveal the true glaucomatous status. Low tension glaucoma should therefore be suspected in any eye with decreased facility and normal intraocular pressure. Although hyposecretion may avert nerve damage, unfortunately these eyes are more susceptible to pressure rises with small increases in secretory activity. Visual field is often lost in diurnal periods or longer intervals of higher secretory activity. Therapy should be directed primarily at the outflow defect; i.e., by the use of miotics.

Glaucoma with elevated intraocular pressure, decreased outflow facility, cupping, and typical field loss may occasionally be spontaneously reversible. Thus, patients with glaucoma proved by all these criteria and with an open angle may subsequently have normal intraocular pressure and outflow facility values without therapy, but damage to the optic nerve will persist. In such eyes progression of field loss and cupping does not occur unless there is recurrence of the outflow impairment.

In some eyes the optic nerve does not appear to tolerate an intraocular pressure which would not damage the average eye. Such susceptible optic nerves may show progressive cupping and field loss at what appear to be reasonably normal intraocular pressures for the average eye. Attempts may be made to maintain these eyes at lower pressures which are compatible with continued function of the nerve.

Rarely, cupping and/or field loss mimicking glaucoma result from diseases, degenerations, or congenital defects of the optic nerve, or from retrobulbar vascular changes, and are unrelated to intraocular pressure elevations.

V. *Medical Therapy of the Glaucomas*

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ANGLE-CLOSURE GLAUCOMA

Indications

Medical treatment of angle-closure glaucoma is necessary as an emergency measure in alleviating the acute attack and as part of the preoperative regime. Medical treatment should, however, not be prolonged, since intermittent unrecognized elevations in ocular tension usually occur. As a consequence, peripheral anterior synechias form and interfere with trabecular function. This prevents the success of a peripheral iridectomy. An exception may be made and long-term medical control attempted in those who absolutely refuse an operation or in the occasional patient who is too frail to risk any surgical procedure.

Therapy

Topical miotics such as pilocarpine 2 per cent or carbachol 1.5 per cent must be used intensively in the involved eye as well as in the fellow eye. The employment of isoflurophate (Floropryl) or related agents is contraindicated because of the induced pupillary block and the marked vasodilation caused by these drugs.

The administration of acetazolamide (Diamox) orally as well as parenterally may become necessary in order to reduce the ocular tension to within safe limits for surgical procedures. It is practical to give 500 mg. of Diamox by mouth if the patient is not vomiting, and to inject half of the contents of the 500 mg. vial intravenously and the remaining half intramuscularly. The dilution is made with 10 cc. of water for injection. Since the advent of carbonic anhydrase inhibitors it is seldom necessary to utilize hypertonic solutions intravenously. It has been observed that urea given intravenously will lower the ocular tension in even the most intractable case.

The retrobulbar injection of a combination of novocaine or xylocaine and epinephrine and hyaluronidase often aids in breaking the attack. Because of its mydriatic effect, the topical use of epinephrine is contraindicated in eyes with narrow angles that have not been operated upon. The analgesic, relaxant and miotic actions of morphine make it a useful therapeutic adjunct.

It is our feeling that intensive medical therapy, if unrewarding, should not be continued for more than eight hours in the treatment of acute angle-closure glaucoma. If by that time the tension is not decreasing, operative intervention is indicated.

An operative procedure, a peripheral iridectomy, should be done if the angle is extremely narrow and if any of the following events are noted: (1) symptoms suggestive of intermittent angle closure; (2) an attack of acute glaucoma in the fellow eye; (3) increasing closure of certain areas of the angle, or (4) a rise of tension above 24 mm. Hg and/or a significant reduction in aqueous outflow that occurs spontaneously or can be provoked by a dark-room or mydriatic test.

CHRONIC SIMPLE GLAUCOMA

Indications

Every effort should be made to control chronic simple glaucoma nonsurgi

cally. Medical management should be continued under the following conditions:

1. The patient is cooperative and understands the necessity of return visits and the need of regular continued medication.

2. While on therapy, (a) there is no progression of field loss; (b) nerve head change is absent or not progressive.

The medical management will be more ideal and the prognosis will be more favorable (1) if the patient is on therapy that is well tolerated; (2) values less than 20 mm. Hg by applanation or Schiøtz scale readings of 4.5 or above with a 5.5 gram weight can be maintained; (3) outflow facilities above 0.15 or preferably above 0.20 can be sustained; and (4) the ratio of ocular tension to outflow facility (P_O/C) remains below 100.

Therapy

Miotics

In the treatment of chronic simple glaucoma, the drug usually chosen for initial use is pilocarpine. It is best to select a 1 per cent solution and increase the concentration of the drug until control is obtained. It is believed that concentrations above 4 per cent seldom cause the eye to become normotensive if a 4 per cent solution fails to do so. The patient is instructed to instill the miotic in the eye or eyes in the early morning and late evening and twice during the day at equal intervals. This procedure may be altered if the diurnal variation so indicates.

Carbachol may be prescribed as a replacement drug when irritation or resistance to another miotic has developed. Carbachol has the advantage of having a somewhat longer action than does pilocarpine. It not only stimulates the motor end-plate of the muscle, as do all the choline substances, but also inhibits to some extent the action of cholinesterase.

Since carbachol penetrates the cornea poorly, absorption may be facilitated by placing it in ointment or combining carbachol with a wetting agent such as benzalkonium chloride. A 1.5 per cent concentration of carbachol is ordinarily used; in this strength it is roughly equivalent in action to 2 per cent pilocarpine. The solution is usually prescribed for use four times a day at equal intervals and the ointment at bedtime.

Physostigmine is usually not prescribed initially or for long periods of time. This drug is apt to produce irritation, and the intense miosis, blepharospasm and cyclospasm are annoying and may make near work impossible. Irritation to the eye is minimized if physostigmine is used in ointment or if the alkaloid is placed in an oily vehicle such as castor oil. There is less disturbance to the patient if the oil or ointment is used at bedtime. A solution of physostigmine 0.2 to 0.5 per cent is usually prescribed to be instilled four times a day, or its synthetic counterpart, neostigmine 5 per cent solution, may be administered four times a day.

Isoflurophate (Floropryl) may be used in the treatment of chronic simple glaucoma once, or at the most twice, each day. Because of its long action it is particularly useful when the frequent instillation of medication is undesirable or impossible. Isoflurophate produces intense miosis, ciliary spasm, headache, and, in rare instances, retinal detachment. Pigmented cysts of the iris may develop after long use of the drug. Isoflurophate is inactivated by water. It is therefore commonly placed in peanut oil to ensure stability. The patient must be particularly instructed not to touch the lid or eye with the dropper and in this

way carry tears into the isoflurophate container. If this does occur, the water from the tears will greatly reduce the effective concentration of the drug.

The usual 0.1 per cent concentration of isoflurophate may be further diluted with an anhydrous oil to a concentration as low as 0.01 per cent in an effort to find a suitable dosage for the individual patient. Isoflurophate 0.25 per cent is also available as an ointment. In such a vehicle, concentration difficulties are avoided and the possibility of water contamination eliminated.

Aqueous Secretory Suppressants

The treatment of chronic simple glaucoma may be enhanced by combining miotic therapy with a drug or drugs that depress aqueous secretion. Carbonic anhydrase inhibitors decrease aqueous flow in man about 50 per cent. Some carbonic anhydrase inhibitors accomplish a degree of secretory suppression at lower dose levels than do others. Side effects, such as loss of appetite, fatigue, drowsiness and the development of urinary calculi, however, occur at a similarly decreased dose level. Fortunately, some patients who cannot tolerate one carbonic anhydrase inhibitor can occasionally tolerate another. For this reason the ophthalmologist should familiarize himself with the use of all the clinically proved carbonic anhydrase inhibitors, such as Diamox, Daranide, Cardrase and Neptazane.

Acetazolamide (Diamox) is the most commonly used carbonic anhydrase inhibitor. This drug may be employed in chronic simple glaucoma for long periods with few, if any, side effects or toxicity. Its use is, however, definitely contraindicated in the continued treatment of angle-closure glaucoma. With the oral administration of acetazolamide, the tension of the eye begins to fall after one to two hours, reaching a low in three to five hours. In the treatment of chronic simple glaucoma, acetazolamide is given orally, 500 mg. to 2 gm. daily in four divided doses. It may be administered one or two hours prior to the peak or peaks in diurnal variation. Such infrequent dosage, however, encourages unresponsiveness to the drug.

Dichlorphenamide (Daranide) is useful as a replacement carbonic anhydrase inhibitor. Its toxicity and side effects are similar to acetazolamide. Metabolic acidosis is less apt to develop, but severe losses of potassium may occur after prolonged use of dichlorphenamide. It is administered orally, 100 to 400 mg. daily in divided doses.

Ethoxzolamide (Cardrase) is another carbonic anhydrase inhibitor with essentially the same action and side effects. This drug is given orally, usually 250 to 1000 mg. in divided doses each 24 hours.

Methazolamide (Neptazane) has the same effect on the eye as do the other carbonic anhydrase inhibitors. The onset of ocular hypotension is delayed, but the drug is excreted slowly, thereby maintaining a longer effective concentration than do other carbonic anhydrase inhibitors. Its side effects are similar to those of the related drugs. Methazolamide is administered orally, usually 150 to 500 mg. daily in divided doses.

Aqueous humor formation may be suppressed by as much as one third if the topical use of epinephrine is combined with the use of miotics. The combination of epinephrine bitartrate or hydrochloride topically with the administration of acetazolamide orally will reduce the secretion of aqueous by as much as 65 per cent. The additive effect of these agents on aqueous secretion is of considerable clinical significance in the management of chronic simple glaucoma being treated with miotics.

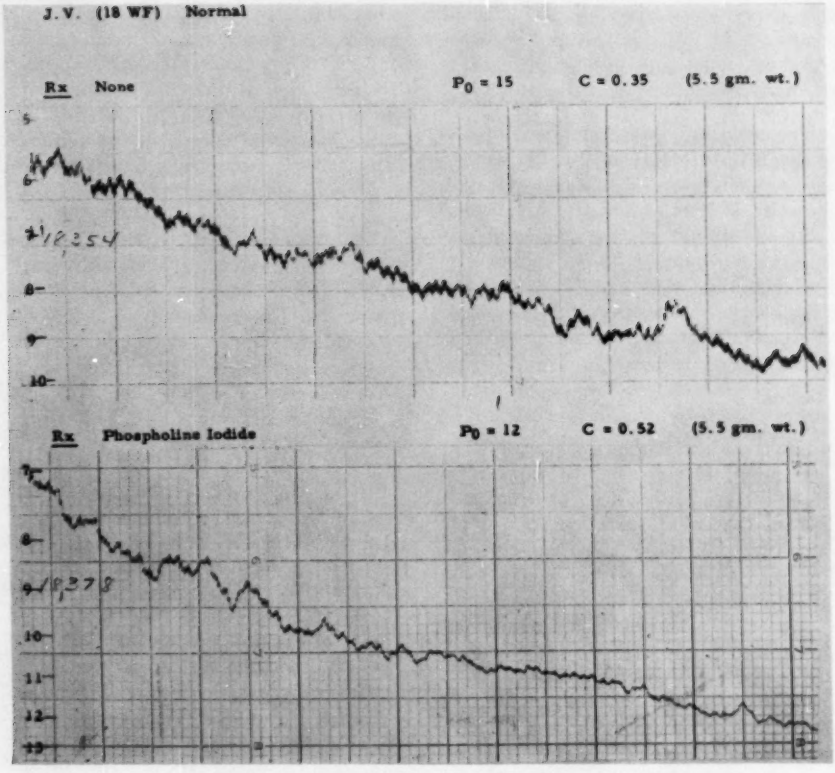

FIGURE 30.

Epinephrine is effective when instilled as infrequently as once every one to three days. Moderate eye and regional discomfort may follow its use. The drug may induce angle closure in eyes with narrow angles. Epinephrine is usually prescribed in 1 per cent ointment or as a 1 or 2 per cent solution.

Therefore, in chronic simple glaucoma every effort should be made to control the disease by means of miotics and, if necessary, to combine their use with epinephrine and/or a carbonic anhydrase inhibitor.

QUESTION: *Discuss the newer miotics —their dosage and advantages.*

DR. BECKER: Echothiophate (Phospholine) iodide is a long-acting cholinesterase inhibitor. It has much the same action as Floropryl but is water soluble and more stable. It should be kept under refrigeration when made up into solution. It may be used in concentrations of 0.1 per cent to 0.25 per cent once every 24 to 48 hours. In normal as well as glaucomatous eyes it improves outflow facility and reduces intraocular pressure (figs. 30, 31). Interestingly

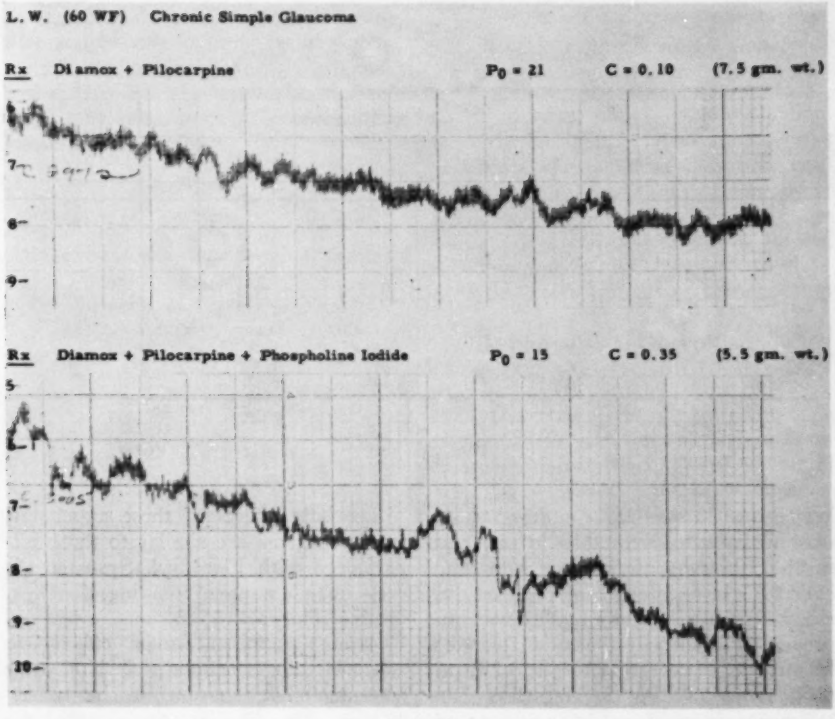
L. W. (60 WF) Chronic Simple Glaucoma
Rx Diamox + Pilocarpine
P_0 = 21
C = 0.10
(7.5 gm. wt.)
Rx Diamox + Pilocarpine + Phospholine Iodide
P_0 = 15
C = 0.35
(5.5 gm. wt.)

FIGURE 31.

enough, the improvement of outflow facility is of the same order of magnitude in the normal and in the responsive glaucomatous eye. Fortunately, this agent is able to improve outflow facility even in some glaucomatous eyes that are not controlled by other miotics. Thus, in a series of 126 consecutive eyes with chronic simple glaucoma uncontrolled on pilocarpine and acetazolamide (or not tolerating carbonic anhydrase inhibitors), approximately 30 to 50 per cent of these could be successfully controlled for a period of over three months on Phospholine iodide. More than half of these could be maintained at pressures of 24 mm. Hg or less at all measurements (table VII) and one third were

TABLE VII

ECHOTHIOPHATE (PHOSPHOLINE) IODIDE 0.25% IN CHRONIC SIMPLE GLAUCOMA UNCONTROLLED ON PILOCARPINE AND ACETAZOLAMIDE* (126 EYES)

CONTROL	EYES	
	NO.	%
$P_o \leqslant 24$	69	55
$P_o < 20$	40	32
$C > 0.10$	64	51
$C > 0.15$	30	24
$P_o/C < 100$	18	14

*Over 3 month follow-up
P_o= intraocular pressure
C = outflow facility

TABLE VIII

DEMECARIUM BROMIDE (BC-48 OR HUMORSOL) (0.25 TO 1.0%) IN UNCONTROLLED CHRONIC SIMPLE GLAUCOMA* (80 EYES)

CONTROL	NUMBER EYES			TOTAL
	0.25%	1.0%	TOTAL	%
$P_o \leqslant 24$	36	18	54	68
$P_o < 20$	26	14	40	50
$C > 0.10$	27	21	48	60
$C > 0.15$	13	9	22	28
$P_o/C < 100$	8	7	15	19

*over 3 month follow-up
P_o= intraocular pressure
C = outflow facility

kept below 20 mm. Hg. Outflow facility was increased to over 0.10 in one half of the 126 eyes of this series, and to over 0.15 in one fourth of the eyes. In many instances, outflow facility was improved sufficiently so that acetazolamide was no longer necessary to control intraocular pressure. P_O/C values less than 100 were induced in 14 per cent of these previously uncontrolled eyes.

Demecarium bromide (Humorsol or BC-48) is also a long-acting water-soluble cholinesterase inhibitor. It is stable in solution and does not require refrigeration. It may be administered in a concentration of 0.25 per cent to 1.0 per cent at time intervals of every 12 to 72 hours. As with Phospholine iodide, 50 per cent or more of a consecutive series of 80 eyes with chronic simple glaucoma uncontrolled on other miotics were brought under control with this agent (table VIII). Most eyes in this series required only 0.25 per cent BC-48, but some needed 1 per cent for satisfactory control for periods of over three months. Outflow facility was improved to over 0.10 in 60 per cent of the 80 eyes, but only 28 per cent improved to over 0.15.

The side effects of these anticholinesterase agents are similar to those experienced with Floropryl. Systemic effects include nausea, vomiting, diarrhea, bradycardia, salivation, and sweating. The most prominent ocular effects are conjunctival congestion, periorbital pain, accommodative spasm and headaches. These symptoms are often relieved by salicylates and rarely persist beyond the first week of administration. Rare instances of fibrinous iritis have been noted. Prolonged administration may result in cysts at the pupillary margin. As anticipated from previous experiences with Floropryl, retinal detachments have already been reported as complications of the administration of these miotics.

Pyridine-2-aldoxime methiodide (2-PAM), atropine or probanthine can be adminstered systemically for reversal of systemic side effects. When 2PAM is administered subconjunctivally in doses of 0.2 ml. of a 4 per cent solution, it promptly reverses all of the effects of the anticholinesterase agents on pupillary size, outflow facility, and intraocular pressure. Thus, in a series of glaucomatous eyes treated with Phospholine

iodide, 2PAM raised intraocular pressure and lowered outflow facility essentially to their status before Phospholine (table IX). 2PAM should be available to all ophthalmologists using potent cholinesterase inhibitors.

TABLE IX

PYRIDINE-2-ALDOXIME METHIODIDE (PAM) (SUBCONJ. 0.2 ML 4%) IN ECHOTHIOPHATE-TREATED GLAUCOMA (AVERAGE 7 EYES)

	BEFORE PAM	AFTER PAM
P_o	18.6	24.0
C	0.14	0.09

P_o= intraocular pressure
C = outflow facility

It is important to emphasize the danger of using the newer miotics in angle-closure glaucoma which has not been treated surgically, for fear of inducing congestion or of increasing the pupillary block by the intense miosis. If such a complication occurs, the prompt use of 2PAM may abort the attack. It is also important to emphasize the necessity for repeated fundus examinations in all glaucoma patients, especially those on strong miotics. Only in this fashion can the earliest signs be detected of potential or impending retinal detachment. Adequate ophthalmoscopic examination can be performed readily in these eyes by dilating the pupils with subconjunctival 2PAM. However, dilatation is more easily accomplished with phenylephrine (Neosynephrine) hydrochloride 10 per cent. Furthermore, the dilatation with Neosynephrine does not interfere with the beneficial effects of these potent anticholinesterase agents on outflow facility and intraocular pressure.

QUESTION: *What should you tell your patient having chronic simple glaucoma?*

DR. HAIK: The great number of restrictions often placed upon the patient with chronic simple glaucoma are not necessary. He should be told of the condition and the importance of therapy to hold the disease under control. He should be encouraged to live as normal a life as possible.

QUESTION: *Discuss the use of Diamox in angle-closure glaucoma.*

DR. BECKER: The use of Diamox in angle-closure glaucoma should be confined to preoperative administration in addition to miotics in the acute episodes. Such carbonic anhydrase inhibitor therapy should be continued only until an operation can be performed. There is considerable danger of prolonged use of carbonic anhydrase inhibitors in angle-closure glaucoma. Unrecognized minor bouts of angle closure occur in spite of the administration of Diamox and result in synechias and loss of trabecular function. These may preclude the use of a simple peripheral iridectomy and necessitate a filtering procedure.

QUESTION: *In case of angle-closure glaucoma, what do you do with the patient who refuses surgical intervention?*

DR. SHAFFER: Selling a surgical operation to a patient is much like selling a pen or a car to the public. The more convinced that the salesman is of the excellence of his product, the easier is the selling job because it bears the ring of honest conviction. It is the rare patient who will refuse. If he does and an attack of angle closure is imminent, one should certainly urge consultation both for the patient's and for the doctor's protection. If he is still adamant, he

should be treated medically rather than driven away from medical supervision by too rigid an attitude. Usually darkroom tests and repeated gonioscopies with discussions of the risks involved in an acute attack will lead to a reconsideration, if the surgeon truly believes that early iridectomy is curative.

QUESTION: *What do you do with the acute angle-closure glaucoma that fails to respond promptly to miotics and Diamox?*

DR. BECKER: Recently several clinics have confirmed the old finding that intravenous hypertonic urea solutions lower intraocular pressure dramatically. This appears to be true regardless of the cause or degree of obstruction to aqueous outflow, the rate of aqueous secretion, the nature of the glaucoma, or the use of other medications.

TABLE X
HYPERTONIC UREA IN ACUTE GLAUCOMA

Dose:	1.0 to 1.5 gm/kg
Concentration:	30% solution (Add 70 ml 10% invert sugar in water to 30 gm lyophilized urea)
Administration:	60 drops/min. *i.v.*
Effect:	intraocular pressure falls in 20-40 min.—minimum at 1-3 hours return to initial P_o 6-10 hours
Contraindications:	impaired renal or hepatic function

Urea is administered in doses of 1.0 to 1.5 grams per kilogram of body weight. A sterile lyophilized urea (Urevert) dissolved in 10 per cent invert sugar so as to make a 30 per cent solution is administered intravenously at about 60 drops per minute. Intraocular pressure falls in 20 to 30 minutes and the marked hypotension lasts for 4 to 10 hours (table X).

The drug has proved especially useful preoperatively in angle-closure glaucoma when all other measures have failed (fig. 32).

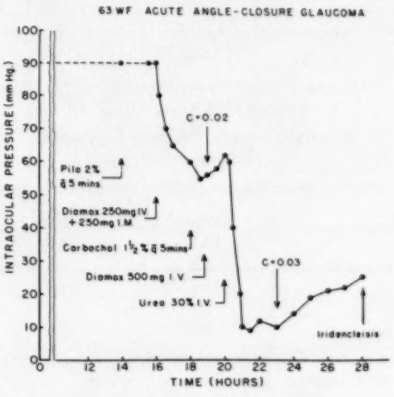

FIGURE 32.

QUESTION: *How would you manage a patient under maximal medical therapy with a residual field of 5 degrees and a tension ranging between 40 and 45 mm. Hg?*

DR. HAIK: If a patient with chronic simple glaucoma has had maximum medical therapy and still has a deterioration of the visual field, with a tension ranging between 40 and 45 mm. Hg, his future course is obvious. Therefore, if the condition is bilateral, surgery should be performed on one eye and then, if the operation is successful, performed later on the other.

QUESTION: *Are you justified in periodically dilating the pupils for fundus examination in patients with well-controlled simple glaucoma?*

DR. MORRISON: The pupil of an eye with simple glaucoma should be dilated

at least once a year or oftener. Fear of precipitating an abrupt, marked rise in tension, or interference with the resumption of the control of the disease is unwarranted. The reasons for periodically dilating the pupil are:

1. Breaks posterior synechias that may occur even in the quiescent eye after prolonged miosis.
2. Permits inspection of the crystalline lens, vitreous, and optic papilla, and an evaluation of the status of the peripheral retina and choroid.
3. Allows verification field study.

The latter is particularly important, since a combination of miosis and cataractous change may bring about field loss simulating the progression of a glaucomatous field defect. There is no need to discontinue miotic therapy in chronic simple glaucoma if Neosynephrine is employed for pupillary dilation, since the tension of the eye is in most instances lowered with the use of the drug. This occurs because of Neosynephrine's suppressant effect on aqueous production without altering the increased outflow induced by miotics such as pilocarpine.

QUESTION: *In periodic rechecking of visual fields, gonioscopy, and tonography, do you advise patients to discontinue the miotics the day before appearing for consultation, or should they be continued?*

DR. SHAFFER: Miotics should always be continued. We should be interested in how the patient is getting along on the present regime. If the diagnosis is in doubt, miotics should be omitted for four to five days for tonography or provocative tests.

QUESTION: *What is the usual cause of failing vision and fields in elderly patients with chronic simple glaucoma under good control?*

DR. MORRISON: The usual causes are (1) the development of lens opacities, (2) lack of good control between visits to the doctor's office, (3) retinal or choroidal changes, usually those of senile macular degeneration, and (4) progression of optic atrophy.

QUESTION: *How do you manage the fellow eye in a patient with angle-closure or chronic simple glaucoma?*

DR. HAIK: In angle-closure glaucoma, the anatomic predisposition of the disease is usually bilateral, and the second eye, if it is not involved simultaneously, will usually be involved later. Prophylactic iridectomy is therefore recommended on the second eye, if the chamber is shallow and the angle is narrow. In making the recommendations, one must consider, as in all intraocular surgical procedures, the surgical risk involved, such as hemorrhage and infection. This risk, however, is less than the risk of an acute attack in the second eye.

In chronic simple glaucoma, even though one eye may be involved before the other, the condition is almost always bilateral. Tonometry and studies of the central field should be carried out at frequent intervals, and if any change is noted in the previously unaffected eye, medical treatment should be started at once.

QUESTION: *What therapy is indicated when cataract complicates either simple or angle-closure glaucoma?*

DR. SHAFFER: The answer to this question is easy in the case of angle closure — the lens should be removed promptly. The reason for this is obvious,

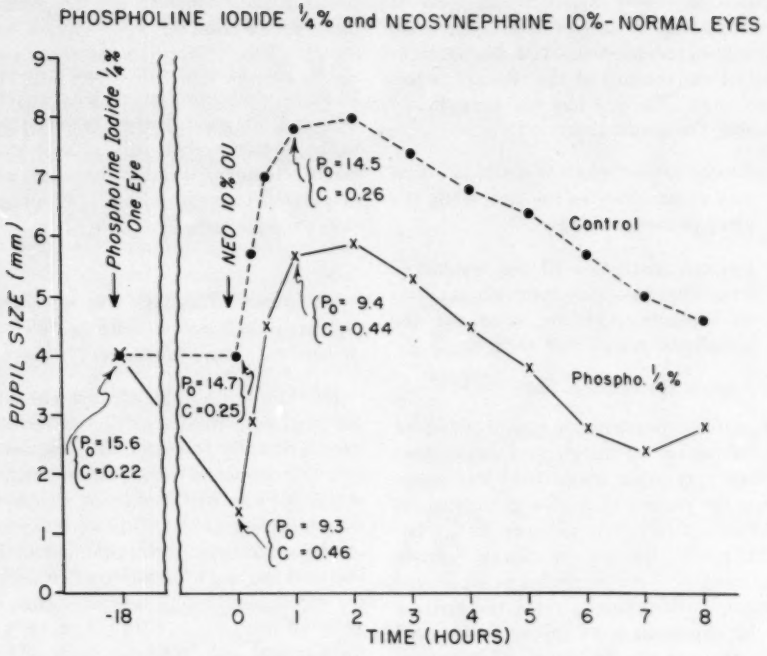

FIGURE 33.

as the cataract and the glaucoma are cured by the one operation. If permanent peripheral anterior synechias are present, the glaucoma would not be cured, but the pupillary block component would be eliminated, permitting the use of the stronger miotics and of epinephrine.

An occasional patient with small nuclear cataracts and health which would not permit cataract surgery could be helped by peripheral iridectomy for the glaucoma and subsequent pupillary dilation to aid the vision.

In simple glaucoma with cataract, there is more room for debate. With incapacitating vision, the cataract should be removed first if the tension can be even moderately controlled. If the glaucoma operation is done first, the density of the cataract usually increases rapidly and its removal risks the patency of a functional filtering area. It has seemed easier to control tensions after lens extraction than before, probably on the basis of a decrease in aqueous production, or small area of unintentional filtration. I do not believe in intentional incarceration of the iris pillar.

QUESTION: *How do you advise your colleagues referable to the use of shock therapy for psychotic states or antispasmodic drugs for peptic ulcer and Parkinson's disease when glaucoma is also present?*

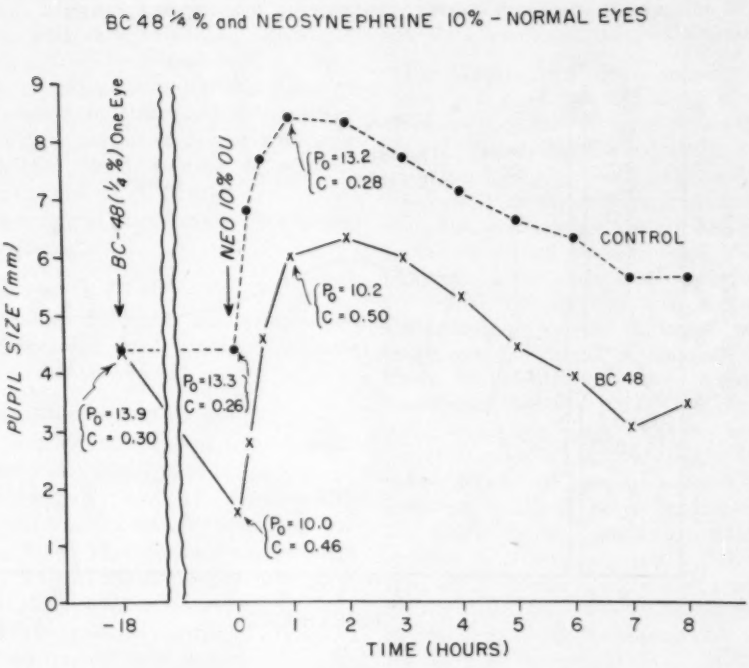

FIGURE 34.

DR. HAIK: If the glaucoma is of the chronic simple type, there is no contraindication to shock therapy or antispasmodic therapy.

In angle-closure glaucoma, if surgery has been performed, antispasmodic medication is not contraindicated. If surgery has not been done, it is best to perform it before shock therapy is instituted.

QUESTION: *What do you do about the patient who complains about accommodative spasm and visual loss from miotics to the point that he is incapacitated in work?*

DR. BECKER: These complaints are particularly common in young individuals. They may be approached by reducing the concentration of the miotic used, by the use of minus clip-ons, and by alterations in time of miotic administration. With the use of the newer long-acting cholinesterase inhibitors, such as Phospholine iodide and BC-48, the administration once every 24 or 48 hours at bedtime may prove of some help. In unusual instances the use of secretory suppressants and lower concentrations of miotics or milder miotics may prove tolerable to the patient and may still control intraocular pressure.

The reduction of visual acuity experienced by patients on miotics is often consequent upon underlying lens changes and the intense miosis. It is often pos-

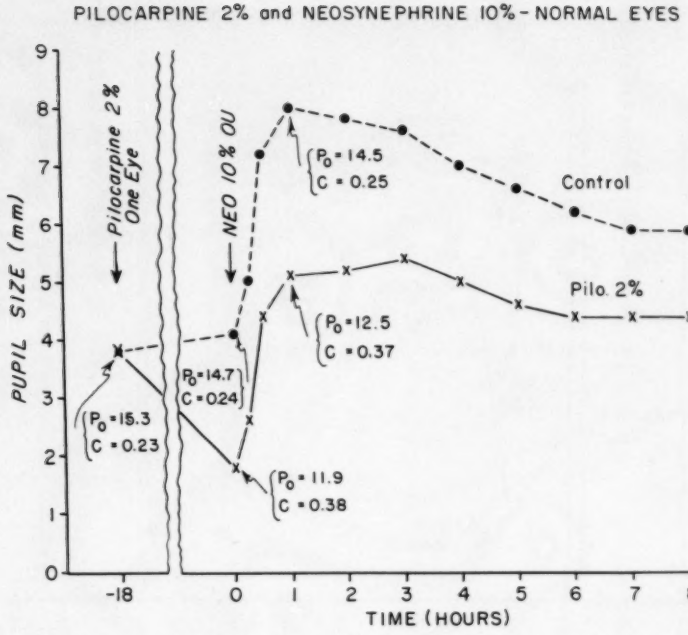

FIGURE 35.

sible to relieve the miosis and dilate these pupils to even larger than the premiotic state with Neosynephrine 10 per cent. The administration of this agent does not interfere with the pressure-lowering effect or improved outflow facility induced by miotics. This has been demonstrated tonographically for several miotics, both in glaucomatous and normal eyes (figs. 33, 34, 35 and table XI).

TABLE XI

PHENYLEPHRINE HYDROCHLORIDE 10% IN DEMECARIUM BROMIDE-TREATED CHRONIC SIMPLE GLAUCOMA (AVERAGE 16 EYES)

	BEFORE	AFTER
P_o	17.6	15.8
C	0.22	0.22
P	1.6	4.1

P_o= intraocular pressure
C = outflow facility
P = pupil (mm.)

QUESTION: *If the eye develops irritation after the use of a certain miotic solution, do you change to a different miotic or change the ingredients of the vehicle?*

DR. MORRISON: Miotic drugs usually do not cause an allergy. Such drugs may, however, deteriorate while in solution to form products of decomposition which disturb the eye. Solutions of miotics should therefore be so compounded as to prevent annoying by-products from forming. If the eye develops irritation, first determine, if possible, whether the

solution has been compounded according to prescription. Second, since the chemicals used in the buffer or as a preservative may produce irritation, change or eliminate the buffer and/or preservative before replacing or discontinuing the miotic. Third, altering the concentration of the miotic and/or co-administering a steroid often aids in eliminating the irritation.

QUESTION: *Do you use miotic solutions prepared by local or by national pharmaceutical houses?*

DR. SHAFFER: Reluctantly, I have been shifting more and more to national products because patients cannot be trusted to go to pharmacies familiar with the problems of safely preparing eye drops. Even when national products are used, patients should be urged to go to good pharmacies where stock will not be kept long on the shelf, as all drugs in solution tend to deteriorate.

QUESTION: *When should you terminate the office management of glaucoma?*

DR. MORRISON: Chronic simple glaucoma, or a condition simulating it, can develop or co-exist in eyes with angle-closure glaucoma. Consequently such eyes should be periodically examined for the presence of chronic simple glaucoma, even though the angle closure has been supposedly cured by peripheral iridectomy performed early in the course of the disease. Damage may occur in open-angle chronic simple glaucoma when pressure limits cannot be maintained at levels compatible with the continued function of the optic nerve. The patient with simple glaucoma must be under constant surveillance, particularly from the standpoint of tension, aqueous outflow, and field and nerve head change. Therefore, when glaucoma continues to exist in an eye or when a different type of glaucoma complicates a once-involved eye, the office management of glaucoma should be terminated only with the death of the patient.

JUVENILE MELANOMA OF THE UVEA

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THIS case is presented to introduce the problem of juvenile melanoma of the uvea. Shortly after the birth of this patient, his mother noticed a "spot" in the right eye, but she was told by the family doctor that it was of no importance. At the age of 2 years and 9 months, the child was seen by two ophthalmologists, and was referred to us in February 1958 because of the possibility of a malignant tumor. The birth and development of this child were normal in all respects and there was no familial history of eye disease or of cancer.

The child was examined under anesthesia. The right eye seemed a little smaller than the fellow eye and the iris was somewhat darker in color. The intraocular tension was 65 mm. Hg with the Schiøtz tonometer. Details of the anterior segment and the fundus were somewhat obscured by corneal edema, but the anterior chamber was of normal depth.

Gonioscopy revealed a fleshy, pyramidal, vascularized mass, arising from the surface of the iris at 6 o'clock and transversing the anterior chamber to adhere to the posterior surface of the cornea at the border of the pupil below. To the nasal side of the lesion, a greyish white nodule appeared, deep within the angle, and at 2 o'clock a fleshy mass protruded out of the angle a very short distance along the posterior surface of the cornea. The iris from 2 to 5 o'clock had a peculiar yellowish brown appearance. The lens appeared to be displaced posteriorly away from the masses at 2 and 6 o'clock. The fundus of this eye showed a diffuse, mottled, pigmentary pattern with a lighter, possibly atrophic, zone above.

On initial examination, a melanoma was considered, but the differential diagnosis included some type of congenital anomaly, medulloepithelioma, and nevoxanthoendothelioma. The left eye was normal in all respects.

While the child was under anesthesia, a broad flap was dissected up from below and a 1.5 mm. trephine opening was made in the angle of the anterior chamber. This opening was enlarged with scissors and the iris was withdrawn with forceps. A complete iridectomy was performed at 6 o'clock, removing the principal tumor mass for biopsy. The lesion proved to be a malignant melanoma and enucleation was performed one week later.

[Slide] This slide reveals a melanoma replacing the ciliary body on one side and extending back into the adjacent choroid, forward into the iris, and onto the posterior surface of the cornea. The tumor cells show moderate variation in size and shape; there are numerous mitotic figures and individual and multinucleated giant cells.

It appeared, then, that this was a malignant melanoma of the uvea in a 2-year-old child. There was, therefore, considerable discussion about the prognosis.

Presented as a *Clinicopathologic Case Report* at the Sixty-Fourth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 11-16, 1959, Chicago

In recent years Allen and Spitz have delineated the so-called "juvenile melanoma" of the skin, a lesion distinct both from malignant melanoma and from the ordinary benign nevus of childhood. The juvenile melanoma resembles a malignant melanoma histologically, but it does not behave clinically as a malignant tumor. Among the criteria outlined by Allen for these tumors are edema, lymphangiectasia, telangiectasia, and hyalinization of the upper cutis; certain forms of giant cells; relatively bland and interrupted junctional change; pseudoepitheliomatous hyperplasia; large discreet epithelium-like clusters of round, polygonal, or spindle cells within the upper dermis, commonly associated with collections of lymphocytes and histiocytes; and, finally, a paucity of melanin pigment in the vast majority of the lesions.

True malignant melanomas do occur in children, but very rarely. They have an aggressive, histologic appearance with both intradermal and epidermal components.

From the point of view of pathogenesis of these unique lesions of children, interest naturally has been directed toward the influence of hormones. It has been frequently observed that melanomas are activated at puberty, during pregnancy, and perhaps following the administration of ACTH and cortisone. It may well be that the hormonal environment of these lesions which appear to be malignant prevents them from spreading as they do in adults.

Reese and others have postulated that uveal melanomas arise embryologically from neural crest cells, and this hypothesis has been substantiated by recent tissue culture studies. It would therefore appear that there may be two broad groups of malignant melanomas, one arising from the basal layer of epithelium anywhere in the body and the other originating from neural crest cells in the eye and, perhaps, elsewhere. Allen and Spitz have argued persuasively for a type of melanoma called the "juvenile melanoma" arising from epidermal cells. The question we are posing is this: Is there an analog in the eye among the neural crest melanomas to the juvenile melanoma of the skin? This is a difficult problem to settle, requiring, as it does, the long-term follow-up of each child to determine the clinical course of his tumor. We are now studying twelve melanomas of the eye and adnexae with no deaths to date from the tumor, but many of the follow-ups are still quite short. We do have evidence, however, that these ocular melanomas may respond to hormonal change. Despite careful study we have not been able to find any histologic characteristics to distinguish these lesions in children from their counterparts in adults.

While it is true that bona fide malignant melanomas do occur in children, it is probable that most of the malignant-appearing lesions which occur in the skin during childhood are of the juvenile variety. This concept has altered the surgical approach to these lesions. If there is an analog in ocular melanomas, we, too, must be conservative in the management of these children. Only careful long-term follow-up and the pooled experience of many observers can solve this problem.

THE TRANSPALATAL SURGICAL APPROACH TO THE NASOPHARYNX

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HONOLULU, HAWAII

IN the fall of 1955, a 40-year-old Filipino woman consulted me with complaints of a severe headache and a diplopia due to a paralysis of the lateral rectus muscle of the right eye. Subsequent examinations revealed that the symptoms were due to a large chordoma of the nasopharynx. As the tumor was a slow-growing type and was radioresistant, it was decided, after a consultation with the radiotherapist, to attempt a surgical removal of the lesion in order to eradicate the disease or to provide palliation.

Under intratracheal anesthesia, the nasopharynx was exposed through the transpalatal approach advocated by Wilson.[12] The exposure of the nasopharynx and the tumor was so excellent that I was able to shell out the tumor mass all the way to the dura overlying the internal carotid artery and cavernous sinus and the area of the base of the skull between the basilar portion of the occipital bone and the sphenoid sinus.

After surgery, the patient's headache was relieved and the paralysis of the lateral rectus muscle disappeared. She remained asymptomatic for over a year, after which time the lesion recurred and the symptoms returned. She was given a course of deep roentgen therapy, but she subsequently died of the disease.

This case convinced me that this approach offers a most direct and satisfactory exposure of the nasopharynx. Since then, I have used this approach in seven other cases of neoplasm of the nasopharynx. It is the purpose of this paper to discuss the merits of this approach to the nasopharynx and to give a description of the procedure.

Lesions in the nasopharynx may be approached surgically (1) through the nasal cavity, (2) by a transmaxillary approach, (3) directly through the oropharynx, and (4) by a transpalatal route.

NASAL ROUTE

The nasopharynx may be approached directly through the nose after shrinking the nasal mucosa with a vasoconstrictor. More exposure may be obtained by outfracturing or removing the inferior turbinate. Removal of the lateral wall of the nose gives further added exposure. Sooy[9] does a septectomy to get a better view of the nasopharynx in the treatment of cases of recurrent carcinoma of the nasopharynx.

Further exposure may be obtained by making an incision around one or both nasolabial sulci to detach the skin and cartilage from the bone and elevating the whole or part of the front of the nose. By this method, the external nose is detached from the internal nose. Among the more recently advocated operations are the rhinotomy approach of Bordley and Longmire[1] and the hemilateral rhinotomy of Williams,[11] which utilizes a rhinoplastic principle and technique.

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While these transnasal routes provide an excellent exposure of the nasal cavity, they do not give a sufficient exposure of the nasopharynx. The nasolabial incision offers a further objection in that it may leave a scar.

THE TRANSMAXILLARY APPROACH

This approach may be made through a nasolabial incision or through a sublabial incision. The nasolabial incisions most commonly used are the Moure and the Ferguson incisions, or their modifications. The lip is divided in the midline to expose the cheek. As much of the anterior and medial walls of the maxillary sinus and part of the turbinates and the nasal bones are removed as necessary for exposure.

The sublabial incision with Denker's extended operation[3] accomplishes the same objective. The advantage of this method over the first exposure is that there is no resultant external scar. This is the approach advocated by Conley[2] in the removal of large juvenile fibromas of the nasopharynx.

While the transmaxillary approach gives a better exposure of the nasopharynx than the nasal route, it still does not give direct access to the nasopharynx.

OROPHARYNGEAL APPROACH

This is the approach used for the removal of the adenoids. It may also be used for removal of small tumors of the nasopharynx. By the use of a palatal retractor or by inserting a catheter through both nostrils to retract the soft palate, a limited exposure of the nasopharynx may be obtained. However, in the case of a large lesion or one situated close to the choanae, this procedure is obviously insufficient.

TRANSPALATAL APPROACH

A look at the sagittal section of the head and neck would easily convince one that the transpalatal route offers the most direct approach to the nasopharynx. Probably its greatest advantages are that there are no important structures that may be injured or destroyed and that the operation is relatively simple.

There are many different variations of the transpalatal approach. Most of the earlier operations consisted of splitting the palate or its various parts in a horizontal direction. A common method is that of splitting the entire length of the soft palate and uvula in the midline. This method gives only a limited access to the nasopharynx, as the lateral halves of the soft palate cannot be retracted sufficiently to afford a satisfactory exposure. Obviously, this method is insufficient.

In 1917, Loeb,[5] in his textbook "Operative Surgery of the Nose, Throat and Ears," first described his transpalatal approach (figs. 1 and 2). It consists of making a midline incision extending from behind the incisor tooth to the base of the uvula. The mucosa of the hard palate and the whole thickness of the soft palate are split as far as the base of the uvula. The hard palate is resected to the extent necessary. The mucosa of the two flaps is then retracted laterally to expose the nasopharynx. Wilson[12] states:

> The main disadvantage of this method is that retraction of the flap laterally is by no means as easy as suggested. The thickness of the soft palate is considerable and the exposure is not as good as theoretically possible, especially in the fossa of Rosenmuller. In addition, the greater the retraction, the more is the posterior part of the soft palate drawn forwards, thus limiting the exposure of the posterior nasopharyngeal wall still further.

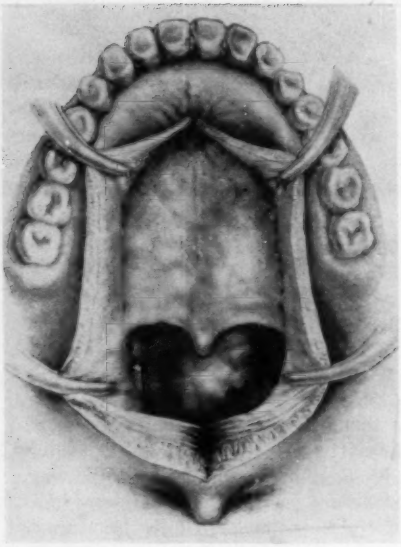

FIG. 1—Loeb's transpalatal approach, showing incision. (From Loeb, Hanau W.[5])

FIG. 2—Loeb's operation, showing removal of part of the hard palate. Note the thickness of the soft palate and the fact that the soft palate will be pulled forward when the lateral flaps are retracted laterally. (From Loeb, Hanau W.[5])

It seems to me, however, that when Loeb's incision is made and the exposure is found to be insufficient, the condition can easily be corrected by cutting through the entire length of the soft palate and uvula.

A better and more preferred method is the use of a transverse incision to separate the soft palate and uvula from the hard palate. This incision was first advocated by Precechtel[7] for the surgical correction of choanal atresia. Modifications of this incision have been used subsequently by Ruddy,[8] Owens,[6] Walker,[10] and others in the surgical treatment of the same condition. It seems strange, however, that while many surgeons were using this approach for correcting a choanal atresia, no one gave any thought to adapting it for the removal of tumors of the nasopharynx.

It was in 1946 that Wilson[12] first described his transpalatal approach, using an incision somewhat similar to that of Precechtel for the removal of tumors of the nasopharynx. His first case was the removal of a mixed tumor growing from the region of the eustachian cushion. He later used the same approach in ten other cases for varied conditions of the nasopharynx with satisfactory results.

Hara,[4] in 1954, described his method of transpalatine approach. In his operation (fig. 3), a transverse horseshoe incision is made down to the bone. The soft tissue over the hard palate and palatine bone is then lifted out of its attachment. When the posterior border of the palate bone is reached, a curved dissector is used to elevate the nasal mucosa from the floor of the nose. The palate bone and the vomer are then removed by a Hajek's biting rongeur. The amount of bone to be removed depends upon the operative indication. A soft rubber catheter is then introduced into each nostril and delivered through the mouth.

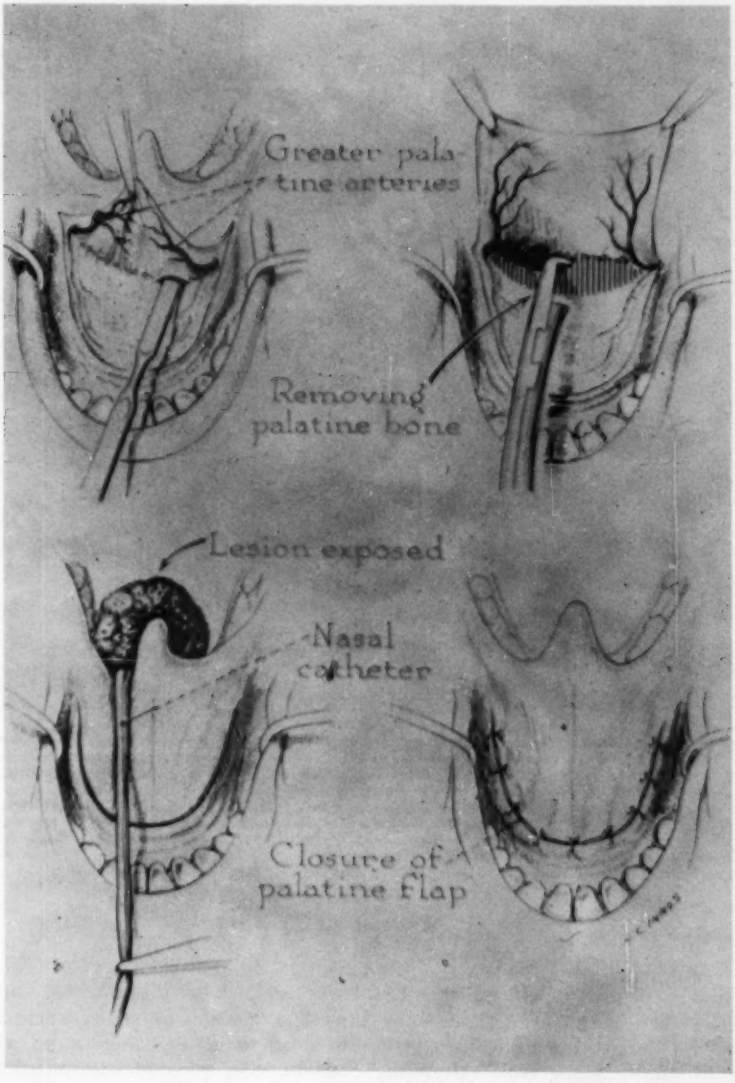

FIG. 3—Hara's transpalatine approach to nasopharyngeal tumors. Note that in this operation, the nasal mucosa is not cut through. Palate bone is resected to the extent necessary and the soft palate is retracted forward by a catheter inserted through the nostril, exposing the tumor in the nasopharynx. (From Hara, H. James.[4])

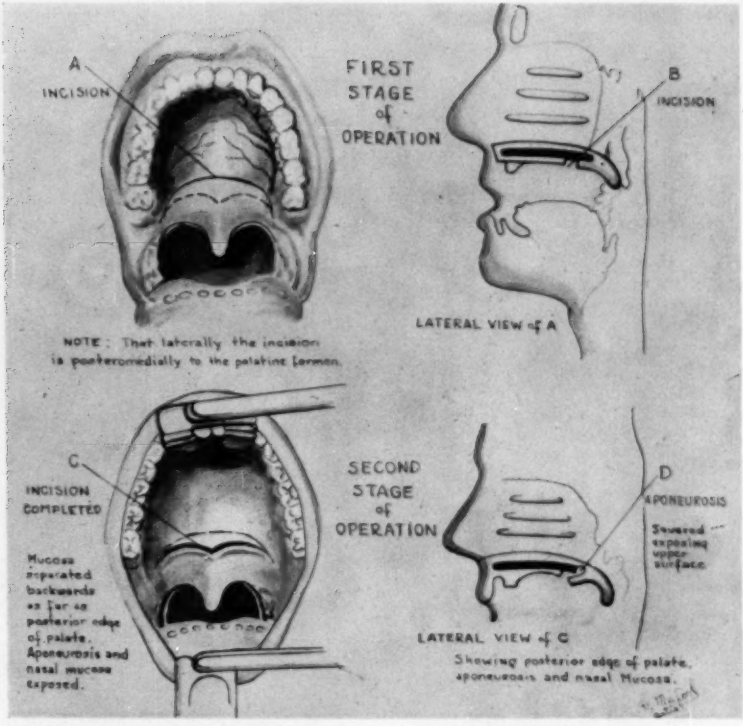

FIG. 4—Transpalatal approach to nasopharynx. (A) Semilunar incision curving forward from inner side of one tuberosity to the other so as to lie at least 0.5 cm. in front of the posterior border of the hard palate. Note that laterally the incision is posteromedial to the palatine foramen so that only the small posterior branches of the greater palatine artery are divided. (Artist has drawn in the palatine artery for emphasis.) (B) Lateral view of (A) showing incision in front of the posterior edge of the hard palate. (C) Separation of mucosa backwards as far as the posterior edge of the hard palate, exposing the aponeurosis and the nasal mucosa. In this area, the soft palate splits into the oral and nasal mucosa. (D) Lateral view of (C) showing the posterior edge of the hard palate, aponeurosis and nasal mucosa. Note that the soft palate splits into two layers.

When gentle traction is applied on the catheter, the entire soft palate is retracted forward and one obtains a good view of the nasopharynx. After the growth is removed, the traction on the catheter is released. The entire flap is gently replaced and sutured. This method differs from that of Wilson in that the nasal mucosa is not cut through, and the entire soft palate must be retracted forward before the nasopharynx can be visualized. The disadvantage of this method, it seems to me, is that in a case in which the lesion has extended into the nasal cavity, a greater amount of palate and vomer must of necessity be removed before the soft palate can be retracted forward sufficiently to expose the tumor.

The approach I use is that described by Wilson[12,13] (figs. 4 and 5) with a few minor variations. Under intra-

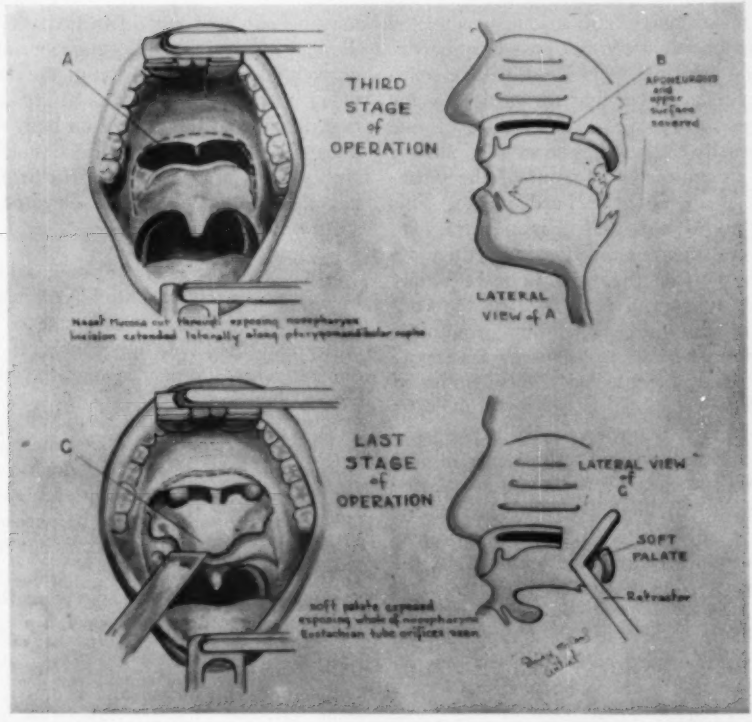

FIG. 5—(A) Nasal mucosa incised at posterior border of hard palate exposing the nasopharynx. Incision is then extended laterally and backward along the raphe for a distance of 1.0 cm. Here the hamulus is identified and fractured medially. The nasal mucosa is now further divided laterally, passing along the anterior edge of the eustachian tube. Note that this incision does not extend as far laterally as the oral incision. If more palate needs to be resected, the oral and nasal mucosa are reflected away and as much of the palate and vomer may be resected as is necessary. (B) Lateral view of (A) showing the aponeurosis and the severed nasal mucosa. (C) The soft palate becomes very mobile and may be pushed downward and backward for a considerable distance. Right angled retractor may or may not be necessary. Note posterior tips of inferior turbinates and eustachian tube orifice. (D) Lateral view of (C).

tracheal anesthesia, the patient is placed in a dorsal recumbent position with a sandbag or pillow under the shoulders so that the head can be fully extended. The surgeon may be at the head of the table or on the right side of the table. I prefer the latter positon as it enables me to look up into the nose. A Crowe-Davis mouth gag is introduced and the hypopharynx is packed with gauze. The packing serves a twofold purpose. It prevents blood from gravitating into the trachea alongside of the intratracheal tube, but more important, it pushes the tube toward the left side so that it will not be in the way of the operator.

The area covering the region of the hard and soft palate and extending backwards on each side of the pterygomandibular raphe is infiltrated with a 1 per cent Xylocaine and Adrenalin solution

for hemostasis. With a long needle, the exact position of the posterior border of the hard palate is identified. A semilunar incision curving forwards is made extending from the inner side of one tuberosity to the other so as to be at least half a centimeter in front of the posterior border of the hard palate. This overlap of soft tissue is necessary to prevent the possibility of a fistula occurring after the operation. It is my policy to vary the distance of the convexity forward depending upon the amount of palate to be resected. If more palate is to be resected, the convexity of the incision should be greater. Laterally, the incision is posteromedial to the palatine foramen so that only the small posterior branches of the greater palatine artery are divided. To avoid the palatine artery, make sure that the lateral extremity of the incision extends to the posterior edge of the hard palate.

The incision goes right down to the bone of the hard palate and the mucosa is separated with a sharp raspatory as far as the posterior edge of the bone. Here, there may be some difficulty in the separation because of the dense aponeurosis and the prominent median spine. By using sharp dissection to cut gently through this aponeurosis, the mucosa of the upper or nasal surface may be elevated for a distance of 1.0 cm. or more with a fine curved Freer elevator or a right angled elevator. This elevation of the nasal mucosa is important for facilitating the closure of the incision later. The nasal mucosa is then incised at the posterior border of the palate bone and the nasopharynx is thus opened. The prominent nasal spine is removed with a gouge or rongeur. The incision is carried laterally and backwards until the pterygomandibular raphe is reached, and then passes backwards along the raphe for a distance of 1.0 cm. Here the hamulus of the internal pterygoid plate may be palpated and identified. Wilson divides it with a small gouge or, alternatively, divides the tendon of the tensor palati muscle passing across it. He states that division of the tendon on both sides does not result in any functional disability. It is my practice to fracture the hamulus medially with an elevator instead of dividing it.

The mucosa of the upper or nasal surface is now further divided laterally passing along the anterior edge of the eustachian tube. This upper incision does not extend as far laterally as the lower or oral incision.

The soft palate now becomes very mobile and can be pushed downwards or backwards for a considerable distance. Occasionally, it may be necessary to use a right angled retractor, but most often this is not necessary. The entire nasopharynx can be clearly visualized. If more exposure is necessary, a portion of the hard palate may be resected.

Bleeding is minimal and is not a serious problem. Electrocoagulation may be used for the control of bleeding, but it should not be used in the area of the incision as it may delay and interfere with healing. After the contemplated operative procedure on the tumor is completed, the wound is sutured. This is quite easy, for the soft palate comes back naturally into position. An attempt is made to suture the upper or nasal mucosa, although Wilson does not feel that this is necessary. I feel, however, that better healing results if this is done. This suturing of the nasal mucosa is facilitated by freeing a few millimeters of the nasal mucosa from the upper surface of the hard palate before severing the soft palate from the hard palate. The oral mucosa is then sutured. Healing is fairly rapid. The postoperative care is minimal. If necessary, antibiotics may be used postoperatively.

SUMMARY

1. The transpalatal route offers the most direct approach to the nasopharynx for the surgical removal of tumors.

2. A transpalatal operation using a transverse incision is described.

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DISCUSSION

HAROLD G. TABB, M.D., New Orleans: In our department at Tulane, we have been very enthusiastic about the transpalatal surgical approach to the nasopharynx since 1953, when the first operation of this kind was performed on our service. It was a case of bilateral posterior choanal atresia and was repaired successfully by the method of Ruddy and Owens. We have since utilized this operative approach in eleven cases, on patients from one month to 65 years of age, for both diagnostic and excisional surgery of the nasopharynx, without difficulty or complication. So, I am pleased to hear Dr. Pang present his paper today, reemphasizing this excellent approach to an area which is the keystone of an otolaryngologist's practice.

I cannot criticize this technique a great deal, since it is essentially the procedure which we use, but I shall make a few comments as I show a film which will illustrate some differences in our methods.

The patient being prepared for surgical exposure of the nasopharynx is placed in the 20-to-30-degree Trendelenburg position, endotracheal anesthesia is induced, and a Davis-Crowe mouth gag is adjusted. I sit at the head of the table with good illumination.

The site of the palatal incision is infiltrated with procaine and Adrenalin to aid in hemostasis. The outline of the posterior border of the hard palate is palpated with a Freer elevator.

A semicircular incision, following the curve of the upper teeth, is made down to the bone across the palate, and a mucoperiosteal palatal flap is elevated from the palatine bone. Here the periosteum of the hard palate is continuous with the palatine aponeurosis. Sharp dissection through the aponeurosis at the posterior edge of the hard palate then opens the nasopharynx to view. Here a residual lesion is removed and the area coagulated.

The soft palate may be retracted further by carrying the line of incision down into the pterygomandibular raphe. The widest exposure of the nasopharynx depends on mobility of the soft palate and removal of the bony palate.

Working from the posterior border, the palatine bone is removed with a Kerrison punch or Hajek forceps. When this approach is completed, the eustachian tube orifices, the fossae of Rosenmüller, the posterior ends of the inferior turbinates and the nasal septum are fully visible.

Primary closure of the palatal flap is performed with a Dupuy tonsil needle. We have always used a single closure of this flap with interrupted silk and have found it satisfactory; however, I think Dr. Pang has a good suggestion in recommending that the nasal mucosa be sutured too.

We have found the transpalatal approach to the nasopharynx very satisfactory in performing operations on the nasopharynx, and I feel that the technique should be familiar to every otolaryngologist.

AN EVALUATION OF THE RAMBO PRIMARY CLOSURE OF THE RADICAL MASTOIDECTOMY WOUND

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and
GLENN B. CRAWFORD, M.D.
BY INVITATION
ANCHORAGE, ALASKA

THE purpose of this paper is to demonstrate that it is now possible to perform a radical mastoidectomy with the expectation that the cavity will be permanently dry, and healed within one month of the day of operation.

Most patients with chronic mastoiditis involving only one ear have already written off the possibility of useful hearing on the affected side. They visit the otologist because they want relief from the discharge, relief from the periodic breakdowns following the common cold, the privilege — especially among the young—of enjoying water sports, and the freedom from worry should water enter the affected ear during such normal activities as shampooing the hair, showering and bathing.

Until very recently, the otologist was confronted with a great dilemma in the case of the patient with a chronically discharging ear due to mastoiditis. While he could point out that surgical intervention would avert any of the dreaded intracranial extensions of chronic mastoiditis, the otologist was unable to assure the patient of a dry ear. He could not predict the length of time that would elapse between operation and complete healing; and he could not assure his patient that he could perform his ablutions and enjoy swimming as a normal individual. These facts, coupled with the fearful reputation of mastoidectomy, kept many patients from undergoing this useful operation and they were lost to otology.

Happily, this dilemma is now resolved. It is now possible to perform a radical mastoidectomy employing the technique described by Lempert[7] in 1949 and the primary closure described by Rambo[9] in 1958 with the expectation that the patient will be completely healed and able to enjoy a normal life within one month.

SCOPE OF PAPER

The purpose of this paper, therefore, is to confirm Rambo's results by a report on 26 consecutive cases using his technique. These cases are compared with 25 cases identical in all respects except that the Rambo primary closure using the temporalis muscle as a source of blood supply was omitted. All cases were operated upon by the same surgeon.

THE PROBLEM IN ALASKA

For the past two years, chronic mastoiditis has been accorded the doubtful distinction of being designated[6] the leading public health problem among the native population of Alaska.

We have discovered over 3,000 cases of mastoiditis. Cases of the disease which have developed because tonsillectomies and adenoidectomies were not done as indicated, continue to be reported. Cases

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cured by mastoidectomy number just under 400. Prevention is barely started and rehabilitation has been under way for less than a year.

Since May of 1958, when Rambo came to Alaska to show us his technique, our results have improved dramatically.

HISTORY OF MASTOIDECTOMY IN ALASKA

From 1940 to 1950, a few Schwartze postauricular radical mastoidectomies were performed in Alaska. An estimated 33 per cent were cured after from one to three revisions and long, painful and disagreeable outpatient care. In May 1950, when we began to use the Lempert surgical approach to the suppurating temporal bone, the results improved. In May of 1957, it was possible to report[4] a consecutive series of 122 cases in which radical mastoidectomy using Lempert's technique had been performed —69 per cent of the patients were cured, 31 per cent of the operations were failures. Among these 122 patients, from one to four revisions of the radical mastoidectomy cavity were done—a total of 34 revisions. Healing time varied between one month and four and a half years.

THE ULTIMATE GOAL

We strove for (and have at last achieved) a technique for doing radical mastoidectomies that can be mastered by any well trained otologist. This technique does not require the use of grafts. It eliminates postoperative care. Hospital care can be done by any physician. There are no serious complications. There is no cavity requiring periodic cleansing by the otologist. Not only is the cavity closed, but the patient may also do any of the things commonly undertaken by those who never had mastoiditis without danger of recurrent discharge and breakdown of the healed cavity.

PREVIOUS OBSERVATIONS

Lempert perfected the operation of radical mastoidectomy by the introduction of light, magnification[5] and suitable instruments. Peterson[8] confirmed our own painfully drawn conclusion that a split-thickness graft used to line a radical mastoidectomy cavity at the time of operation is nothing less than a built-in cholesteatoma.

The many articles we read on radical mastoidectomy attested to the general dissatisfaction with published techniques. Lempert himself, in the article alluded to, did not publish his results after using his technique. In Coates, Schenck and Miller's textbook of Otolaryngology,[2] techniques of radical mastoidectomy are given, but the results of those using them are not. However, the implication in these and many other contributions is that the breakdown is due to overlooked "infection." We no longer believe this.

We believe, following a meticulously done radical mastoidectomy, that nonhealing and breakdown are due to poor blood supply. We, as unnumbered otologists before us, failed to realize the importance of the annoying bleeding that ensued if, during the performance of endaural radical mastoidectomy, we accidentally nicked the temporal muscle. So, we missed the immortality that Rambo has deservedly achieved by converting the annoyingly vascular muscle into the *sine qua non* of blood supply for the radical mastoid cavity. Rambo, by his serendipity (defined as discovery by chance, or by sagacity, of things not sought for) has brightened not only the lot of the patient with unilateral chronic mastoiditis, but also that of the operating otologist.

POINT FOUR IN YOUR OWN BACKYARD

By letter, we had kept Rambo apprised of our many trials and few tri-

umphs since beginning endaural mastoid surgery in 1950. In 1958, at our invitation, he came to Alaska for two weeks and did three operations,[1] as described in his papers. Thus, he probably traveled the greatest distance for the smallest class, resulting in the greatest good for the largest number of patients, of any teaching otologist in history. This, perhaps, confirms the theory that it is possible to do significant research, carry modern techniques to the medically underprivileged, and teach obscure but well trained doctors in less than a university hospital without a grant from the NIH, without a scintillometer and without a team of astrophysicists.

SELECTION OF PATIENTS

All patients who were candidates for a mastoidectomy who were not suffering either an acute exacerbation, which made immediate operation necessary, or any of the intracranial complications of mastoiditis, had their tonsils and adenoids removed. This procedure was combined with a trial of conservative management, which meant the use of antibiotics orally and parenterally as determined through the routine use of bacterial sensitivity tests on aural discharge. In each case, a preoperative audiogram was recorded.

Before the introduction of the Rambo closure in five cases, the onset of intracranial complications developed while the patients were in the hospital awaiting their turn at mastoidectomy. Two were brain abscesses. There were two cases of meningitis of otitic origin and a third case in which the cerebral symptoms made either of the above diagnoses possible; but these were never proved at operation or subsequently. In addition to these, there were two patients reported in this group who developed acute and dangerous exacerbations of their chronic disease making operation immediately mandatory. Another patient was dead on arrival from brain abscess and one died after mastoidectomy and neurosurgery for brain abscess using the classical radical mastoidectomy technique.

OPERATIVE TECHNIQUE

Three inches of scalp are shaved above the ear. We use intravenous anesthesia for adults and ether for younger children. Two per cent Xylocaine with Adrenalin is used subcutaneously in minimal amounts in the soft tissues of the canal, over the incision site in the fossa, and also behind the ear. Two incisions through the skin and subcutaneous tissue are made in the external auditory canal beginning at the junction of the bony and cartilaginous portions at six o'clock and twelve o'clock. The twelve o'clock incision is led out through the skin overlying the hiatus between the spina helicis and lamina tragi and then posterosuperiorly in a curvilinear sweep (figs. 1 through 9) up over the temporal

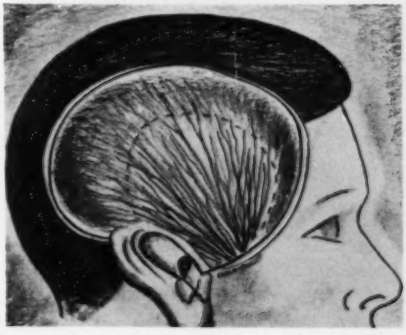

FIG. 1—The temporal muscle and its relation to the site of the operation.

muscle, more or less paralleling its fibers. The incision penetrates the subcutaneous tissues of the skin and the variable extrinsic muscles of the external ear down to the temporal muscle. The primary in-

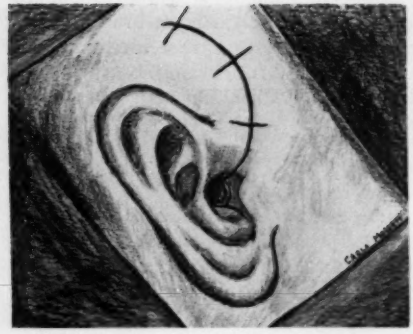

FIG. 2—Incisions in the canal at six o'clock and twelve o'clock. The latter is extended over the temporal region and crosshatched for accurate closure. Both incisions are connected at the junction of bony and cartilaginous portions of the canal.

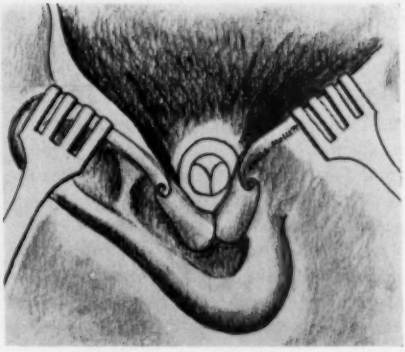

FIG. 4—The temporal muscle exposed and the flaps from the canal completed.

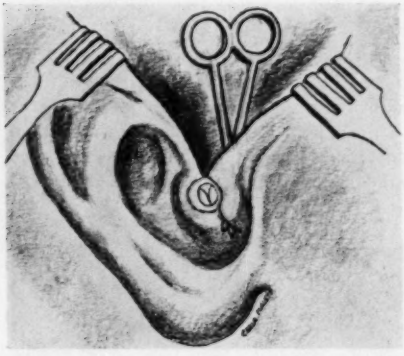

FIG. 3—The temporal muscle is exposed and freed from extrinsic muscles of ear, skin and subcutaneous tissues. Anterior and posterior flaps are developed from without inwards.

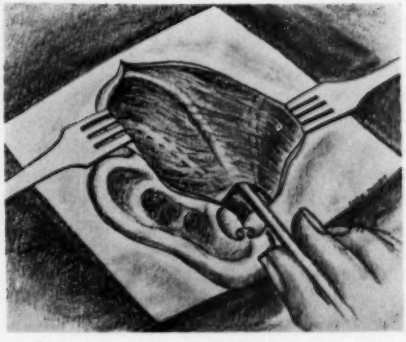

FIG. 5—After the radical mastoidectomy is completed, the temporal muscle is separated from the underlying skull by blunt dissection.

cisions are connected anteriorly and posteriorly at their points of origin, and the anterior and posterior flaps are developed from without inward to the approximate junction of the cartilaginous and bony portions of the canal. The soft tissues beneath the concha are excised and the temporal bone is exposed with the periosteal elevator. The self-retaining retractor exposes the field of operation beautifully if the incisions are made as described. A radical mastoidectomy (Lempert) is then done. Then the temporal muscle is separated from the underlying skull with periosteal elevators. An incision is made under the overlying skin and subcutaneous tissues around as much of the origin of this muscle as can be reached. The fibers of the muscle are then split so that a large tongue of it, still attached at the point where it goes down to the temporomandibular joint, is made available. The muscle, with its pedicle still attached, is led into the cavity and spread out like a fan.

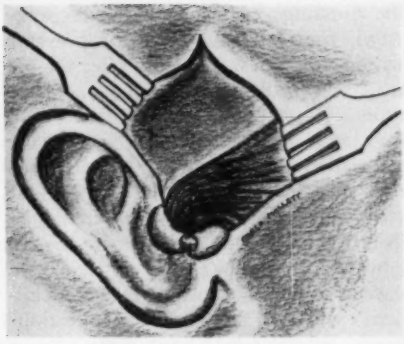

FIG. 6—The temporal muscle has been cut free along its origin and is now a pedicle flap. The free portion is spread out in the mastoid cavity, filling as much of it as possible.

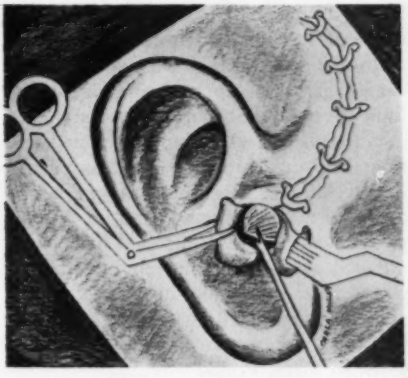

FIG. 7—The upper incision is closed with skin clips.

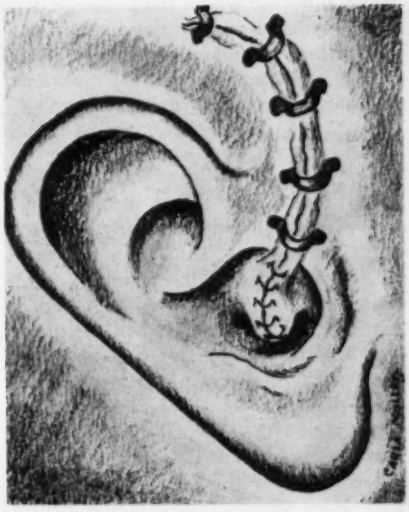

FIG. 8—The skin flaps from the canal are sutured to one another and are pushed back into the ear, forming a blind pouch.

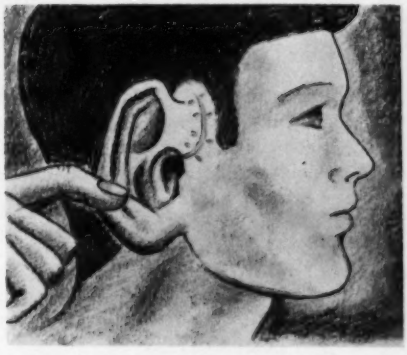

FIG. 9—A patient two weeks after radical mastoidectomy and a Rambo primary closure.

The self-retaining retractor is removed. The incision over the temporal fossa is closed with skin chips except in the case of small infants, when we employ 4-0 chromic interrupted suture. The two flaps of the external canal are then apposed with interrupted 4-0 chromic sutures after they have been trimmed in such a fashion that when they are pushed down into the cavity, like inverting a sock which has been properly darned, they form a blind pouch a few millimeters in depth thus constituting a cosmetically acceptable external canal. No drain is placed in the wound, because in the early cases when one was so placed in the wound, the patient's adjustment of his bandage frequently pulled the drain from the incision. Since no harm resulted in these cases, the drain has been eliminated altogether ex-

cept in one case where the presence of a Bezold's abscess with flag-like protrusion of the ear and high fever made the use of a Penrose drain for five days seem advisable.

DRESSINGS

At first, the operative wounds were dressed daily. Then one case got "lost," as the saying goes, and it was not until the seventh day that the patient was rediscovered because he was supposed to be in Clinic. We found, when the dressings were removed, that the condition of the operative site was perfect. Since then, dressings have been left undisturbed until the seventh postoperative day. Then the skin clips are removed. If the wound over the temporal fossa has been closed with 4-0 chromic, the sutures are not disturbed. The chromic sutures in the blind pouch simulating the external meatus are also left to slough out by themselves.

MEDICATIONS

Procaine penicillin, 600,000 units every twelve hours for seven days, is ordered. Bacterial sensitivity tests determine which antibiotic or sulfonamide will prove most useful. These medications are continued for three weeks running concurrently with the procaine penicillin.

COMPLICATIONS

In two classical Lempert radical mastoidectomy cases, the patient developed transient facial paralysis. The same was true among those in which a Rambo closure was employed. In two cases, serum collected beneath the flap. The amount of serum in each case was less than three cubic centimeters. Evacuation of this serum and application of hot wet packs daily for four days resulted in a cure. Two patients developed large hematomas in the temporal fossa. In both instances, the dressings came off in the recovery ward, permitting a release of pressure within a very few moments after the patient was returned from the operating room. This, of course, permitted bleeding, and a hematoma formed. Daily evacuation of the hematomas caused their disappearance in four days. One postoperative wound diastasis, caused by the struggles of the child during the removal of skin clips, made us change to the use of chromic sutures on small children. We feel that these complications in no way prolonged morbidity.

One patient died of brain abscess four months after operation. On his initial visit, made because of vertigo, operation was recommended but refused because of a projected trip to the mainland of the United States. Two years later, he came back semistuporous and with signs indicative either of brain abscess or of meningitis. He was admitted immediately and operated upon the next day using this technique. A granuloma one centimeter in diameter was found on the exposed dura. Because this case in no way differed in history and findings from many other cases, the same closure was made. The patient's postoperative course was uncomplicated and he went back to work in three weeks.

During a severe local epidemic of influenza, the patient came in complaining of headache. After examination, he was referred to his family doctor; six weeks later, still suffering from headache, he was sent back by the family physician for a refraction!

Examination revealed brain abscess with marked papilledema, proved within twenty-four hours by neurosurgical operation, death and postmortem examination. Gross examination of the specimen showed an abscess, five centimeters in diameter, which apparently started at the

granuloma on the dura and extended toward the center of the temporal lobe. The operative site was filled with fibrous tissue. We do not think that operation or closure influenced the course of this unfortunate patient's illness. We feel that had he been asked to return when his headache persisted for more than a few days, the outcome might have been different. All patients are warned that headache and other ominous signs indicate immediate consultation.

REMOTE POSTOPERATIVE COURSE

Four patients have had severe colds with no complications. All ears remained healed up to this date (January 25, 1960) and trouble free for periods ranging from nineteen months to six months.

PATIENT REACTION

All patients were greatly pleased by their convalescence. They were happy to be working again within four weeks, completely healed, without the need for further postoperative care. All patients were gratified at being able to lead lives undistinguishable from those of people who never had mastoiditis.

RESULTS

In the healed classical endaural radical mastoidectomies, the longest case was healed in 457 days, the shortest in 90 days and the median in 197 days. Following the introduction of the Rambo technique, the longest case was healed in 42 days, the shortest in 7 days, and the average in 19 days. In the 26 cases done in the pre-Rambo manner, eight failed to heal. In the post-Rambo technique, all cases are healed perfectly.

In the pre-Rambo group, nine out of 26 cases required repeated surgical intervention, while there were none in which Rambo's primary closure was used that required secondary procedures.

SUMMARY

It is now possible for any meticulous well-trained otologist to do a radical mastoid operation and expect the patient to be completely healed and fully restored to his job and other responsibilities within a period of one month. The use of the Lempert technique for doing a radical mastoidectomy and Rambo's technique of primary closure using a tongue of temporal muscle and skin flaps developed from the external auditory canal, is the basis for this excellent result. The patients may lead normal lives without fear of breakdown and recurrence. Twenty-six cases in which the Lempert endaural radical mastoidectomy was performed without the use of Rambo temporal muscle flap and primary closure are compared with 25 cases in which the Rambo technique was added to the method described by Lempert. In the former group, 16 patients attained dry ears after hospitalization extending from 90 days to 457 days. The primary closure cases were all well within a period of seven to 42 days, the average being 19 days. We feel satisfied with our results using Rambo's closure.

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DISCUSSION

J. H. THOMAS RAMBO, M.D., New York: It is a pleasure to discuss Dr. Fritz' and Dr. Crawford's paper, and to acknowledge my indebtedness to them for this evaluation of primary closure following radical mastoidectomy.

To any visitor, Alaska is a remarkable and stimulating experience. And I might say there were times in flying around with Dr. Fritz in his small plane that it got so stimulating that I could hardly stand it. Dr. Fritz assured me that he was a *good* pilot—the only thing that bothered me was that he kept showing me one mountainside after another that had become notable because some *good* pilot had bounced into it. I'm not saying that he was using it, but I will say that he has the most subtle method for discouraging competition from coming into his area that any doctor could ever use.

Alaska is many things, but to an otologist the place is simply astonishing. Dr. Fritz has already told you that chronic ear disease is the major health problem there, and that there are three thousand patients who are in need of ear surgery. In some of the isolated villages, and I was shown one north of the Arctic Circle, over half of the native population have chronically running ears. Seventy-five per cent of the patients admitted to the Alaska Native Service Hospital, for whatever reasons, are said to have grossly visible ear disease. I had great admiration for the efforts being made to meet this situation, but the problem is immense, and the need for government appropriations and medical personnel is great.

There were a number of reasons for taking this new technique to Alaska, but certainly among them was the hope that Dr. Fritz would not only find some advantage in primary closure, but that he would also, in using it, put it to a clear-cut clinical test. Having observed his temporal bone work, and knowing his surgical ability, I felt confident that he would precede his primary closures with careful, and meticulously performed, radical mastoidectomies. The results that the authors have presented in this paper are evidence that they have done just that. I wish to congratulate them on a great deal of hard work and excellent surgery.

Dr. Fritz has used a modification which I find very interesting and which has apparently been completely successful in his hands.

Now about the complications—

He has had retention of a small amount of serum beneath the flap in two cases. This was easily evacuated, and with packs of hot saline solution healing resulted in four days. I have not experienced this complication, I believe, because I leave a drain in for two or three days, just as I would in the primary closure of a simple mastoidectomy. I think this is good surgical practice.

In my cases, one hematoma occurred in the parietal area where the scalp is elevated and the muscle flap removed. This occurred in the same way as in Dr. Fritz' cases, as a result of a mastoid dressing coming loose soon after operation. Those minor complications can happen in any surgical wound and are easily avoided. One of the decided advantages of primary closure is that the wound is exteriorized, and if complications occur, the wound can be soaked with warm saline solution, just as with any other soft-tissue wound elsewhere in the body.

Now about the brain abscess which occurred in this series of cases with primary closure. With the potentialities for intracranial complications that can develop when 3000 cases need mastoid surgery, I suppose that it was inevitable that at least one serious complication would turn up in a consecutive series of cases using primary closure, or any other

technique, especially since in the group of cases done prior to the use of primary closure, Dr. Fritz cites four cases of brain abscess and three of meningitis. The authors have already stated that they do not believe that operation or primary closure influenced the course of this intracranial complication. After reviewing the history of this patient and studying the post-mortem specimen sent to me by Dr. Fritz, I am as convinced as they are that this is so. This case could not properly be omitted, since it did occur in the series. In presenting it, however, it becomes necessary to make the pertinent pathological facts clear in order to avoid any misunderstanding that the abscess developed as a result of primary closure. The patient came to the surgeon the day before the operation with stupor and drowsiness, and complaining of severe headache. The finding at operation was a cholesteatoma with a large pathologic defect of the tegmental bone. There was a granuloma of the meninges in this exposed area. Bone was resected around the granuloma until dura which seemed healthy was seen. The radical excision was completed and the cavity closed primarily. The patient received massive doses of penicillin in the hospital and was sent home on Kynex medication. Dr. Fritz has said that he has had cases with findings that appeared similar, which got well on heavy dosages of antibiotics combined with radical mastoidectomy. I think we can see in retrospect, which is always the most comfortable position from which to judge these matters, that the focus of the abscess was already too well established to be cured by antibiotics—and, indeed, the postmortem specimen revealed a collar-button abscess extending inward from the granuloma with a capsule 2 mm. thick. There were signs of infection superficial to the dura, and there was no evidence of infection in the mastoid cavity, which indicates, of course, that suppuration did not arise in the cavity beneath the primary closure and extend intracranially.

In explaining this case, I do not wish to convey the impression that I think the issue is to know whether or not primary closure influences a focus of infection which is not eliminated from a radical cavity. I have said in the paper describing this technique that one thing is essential to its use—all foci of infection and all squamous epithelium must be removed before closing a radical cavity primarily.

I would remind those who intend to use this method that our first duty to a patient with a chronic ear infection is to make the ear safe; our next responsibility is to preserve and restore hearing whenever possible; and a third obligation, in that order of importance, is to give the patient a dry ear. Primary closure is a remarkably effective method for rapidly getting an ear healed and dry after radical mastoidectomy, but it is not a technique to be used in every case. Where symptoms, or operative findings, indicate the possibility of future trouble, or where there are foci of infection, or epithelium, an open cavity should be maintained. This does not mean that healing in a short period of time is lost. If a temporal muscle pedicle flap is simply brought down into an open cavity and positioned in such a way that it closes the eustachian tube orifice, but does not cover questionable infected areas, an abundant blood supply for the healing process can be obtained. Such an ear will invariably heal in about six weeks to two months. The problem of secondary healing is mainly one of the blood supply. We need only to recall how well scalp wounds heal, where there is a rich blood supply. I have described this method in the same paper as that giving the technique for primary closure.

In Alaska, where patients have to be flown in to Anchorage, operated upon, and then returned to remote areas, where even the most elementary medical care is not available, it is essential that a reliable and quick method of healing be used, if much surgery is to be done. I think it is clear that Dr. Fritz is going to continue to deal with serious ear disease. The only criticism that I can find to make after hearing this paper is that primary closure should not be considered a technique to be used in every case. Where symptoms or operative findings suggest the possibility of future complications, I would suggest that the surgeon leave the cavity open, utilizing a temporal muscle pedicle flap to furnish blood supply. They can still get rapid healing without the risk of covering foci of infection.

I wish again to congratulate Dr. Fritz and Dr. Crawford on this excellent paper. I think they have made a real contribution. With the tremendous reservoir of chronic ear disease which is available to them in Alaska, I am sure they will soon forge ahead of us in that field.

DR. FRITZ: It is neither right nor just for the senior author to return to oblivion without acknowledging before this august group the names of certain individuals without whose help, inspiration, patience and hard work this paper would have been impossible. I refer to the Alaskan natives, to my wife Elizabeth B. Fritz, R.N., to a great ophthalmologist Phillips Thygeson, M.D., to Julius Lempert, M.D., and to J. H. Thomas Rambo, M.D., to whom all Alaskans owe so much.

THE VESTIBULOGRAM: A GRAPHIC RECORD FOR THE EVALUATION OF VESTIBULAR NYSTAGMUS

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ELECTRONYSTAGMOGRAPHIC studies of vestibular function, conducted by many investigators in various countries, contributed greatly to a better understanding of vestibular physiology and to the diagnostic evaluation of equilibrial disorders. The objectively recorded electronystagmograms (ENG) permit the quantitative assessment of all basic qualities of vestibular nystagmus and their analysis into minute details.

At the present time, however, such recordings are meaningful only to the few experts who have learned to interpret the curves of their lengthy graphic recordings. If the attempts at objective registration of vestibular phenomena are to gain acceptance by the practicing otologic profession, a condensed and summarized description of the vestibular reaction will be required. This should be in the form of a handy graph which clearly demonstrates the differences between normal and abnormal findings and expresses these differences in some appropriate quantitative terms.

In order to establish principles for obtaining such a practical graph, further elaboration of the ENG tracing has been suggested. The results of the evaluation of our first 35 examined patients (70 ears) will be discussed in this paper.

This study was planned and investigated by Francis Miskolczy-Fodor, aided by the conscientious technical assistance of Mrs. Anna Binger, while Godfrey E. Arnold was responsible for the general organization of the project.

The caloric vestibular nystagmus elicited in these 70 ears was recorded by means of the Grass electroencephalograph, model III D, according to the principles described in previous papers.[1,2,13] Caloric stimulation was achieved by injection of 10 cc. of water, 70° F., into the external ear canal within 10 seconds. Bitemporal skin electrodes served for the pickup of the corneoretinal potentials. The head was flexed 60 degrees backwards in optimal position for the entire duration of the vestibular reaction. External and internal artefacts were reduced by dark adaptation, complete relaxation, Frenzel goggles, wire cage, etc.

Dependent on the total duration of the nystagmus, a sufficient number of sample periods was selected from the entire ENG tracing (fig. 1). Each sample contained a group of successive nystagmus beats lasting from 3 to 10 seconds. The samples were selected from suitable parts of the ENG tracing at

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fairly evenly distributed time intervals. For each sample period the following magnitudes were then determined: (1) average frequency, (2) average amplitude, and (3) their product.

Employing standard EEG equipment, the method of obtaining the amplitude of nystagmus consisted of the following steps, as was described in previous papers.[2,13]

d. The amplitude is determined by two different methods: computation of the spike territory from the velocity tracing (spike territory = velocity x time = amplitude); measurement of the amplitude of the same spikes after having established a logarithmic relationship between the spike amplitude of the velocity tracing and the angle of the respective eye movement.

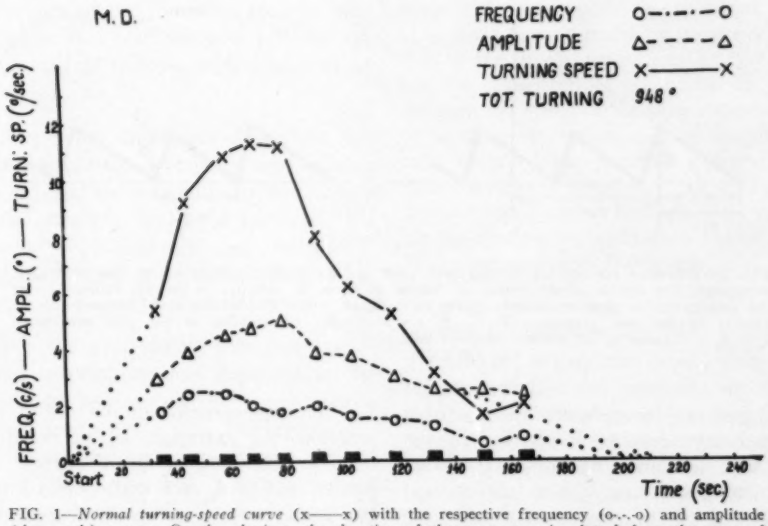

FIG. 1—*Normal turning-speed curve* (x——x) with the respective frequency (o-·-·-o) and amplitude (Δ - - - - Δ) curves. On the abscissa, the duration of the nystagmus is plotted from the start of stimulation. The graduation of the ordinate expresses the values of frequency in cycles per second, amplitude in degree, and turning speed in o/sec. ■ indicates the sample period. Total turning, 948 degrees. Dotted lines: extrapolation of the curves.

a. Selecting very short time-constants, the angular velocity of the eye movements is recorded with the RC amplifier of the EEG apparatus.

b. The system is calibrated with induced eye movements of various predetermined angles.

c. From each calibration, a nomogram is composed in order to determine the amplitude of the eye movement.

e. The velocity tracing of the fast nystagmus component is performed through the same channel and with the same amplification characteristics.

f. The amplitude of the fast nystagmus component is determined by the nomogram. Since the average amplitudes of the fast and slow nystagmus components are equal, the determined amplitude of the fast component is equal to that of the slow component.

The product of average amplitude and frequency is called the *turning speed* of the respective sample period. It indicates a theoretical rotation of the eye for one second by adding all single nystagmus beats within the time unit, as if the slow phase of nystagmus were a continuous movement, and if the saccadic backrolling of the eye (fast phase) were excluded from the nystagmus. The turning speed of the eye is a term for this particular type of angular velocity of the nystagmic eye movement. The use of a special denomination is justified by the fact that for a given nystagmus the value of turning speed is slightly smaller than the speed of the slow nystagmus component.

Velocity computations from the average amplitude and frequency are performed for time segments which exceed the duration of the slow component. It includes, therefore, time elements which belong to the fast component (fig. 2).[9,10,11]

For each sample period, the values of amplitude, frequency, and turning speed were then plotted in a graph as a function of the duration of the vestibular reaction, and the resulting curves were composed by connecting the single values (fig. 1).[18]

None of the curves begin or end at the time axis (base line). The recorded start and end point of the nystagmic response are subject to the sensitivity and liminal level of the particular observation used. This liminal level of observation is the weakest discernible nystagmus beat which can be distinguished among other artefacts of the tracing. The *total duration* of the reaction seems to last longer than the occurrence of the actually observed last nystagmus beat.

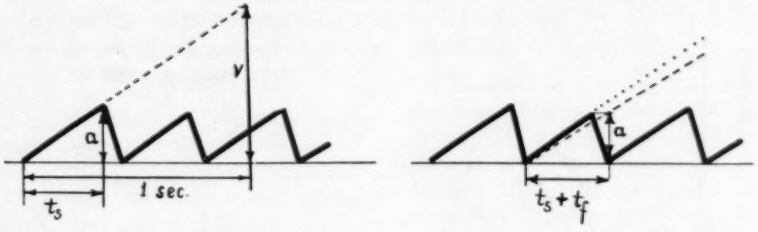

FIG. 2—Difference between the *turning-speed* value and the *angular velocity* of the slow nystagmus component. The decline of the nystagmus tracing indicates the velocity: in the left figure, - - - - is the velocity of the slow component; in the right figure, - - - is the turning speed compared to the velocity of the slow component (. . . . .). a = amplitude; t = duration of the slow component; $t_s + t_f$ = duration of the entire nystagmus beat.

For the determination of the end of the reaction, the extrapolation of the frequency and turning-speed curves, as plotted in our figures with dotted lines, has been considered a better approach than the recording of the last discernible nystagmus beat. Especially valuable are extrapolations when the two curves reach the time axis at the same point.

The integration of the entire turning speed curve, i.e., the area bounded by the curve, gives the *total turning (total amplitude*)* of the nystagmic eye movements. The total turning indicates the number of eye revolutions, in degrees, which would theoretically occur if the

*The term *total amplitude* has been used by several previous authors. Since *the amplitude* is a term for defining the periodic maximum value of a time-variable quantity, some misinterpretations may arise when using it to define the final value of a continuously increasing magnitude.

slow nystagmus component consisted of a continuous eye rotation, without being interrupted by the saccadic backrolling of the eye during the fast phase.

For a control of our computations, the turning speed curve and the total turning of the eye are separately determined from the amplitudes obtained by the two described methods. One determination is based on measuring the spike territories, the other on measuring the spike amplitudes. For 70 ears, the mean difference of the computed total turning by these two methods was 1.01 ± 0.04, expressed as a ratio, with a median of 1.06.

Among the three time-dependent factors (amplitude, frequency, and turning speed) and the two summarized factors (total duration and total turning), the product of amplitude and frequency, i.e., *the turning speed and the total turning*, seem to be the most important.

For the past twenty-five years, scattered information has appeared in the literature concerning the speed factors of vestibular nystagmus. During the early days of nystagmography, Buys[4] (1924) and Dohlmann[5] (1925) observed that the *speed of the slow component* of vestibular nystagmus is proportional to the intensity of a vestibular stimulus. This stimulus may be applied either as an angular acceleration on a rotating chair or as a temperature difference between the subject's ear and the irrigating water. Many other authors confirmed this opinion and emphasized the importance of recording the ocular speed for the purpose of testing the vestibular function (Hallpike and Hood,[8] Mittermaier,[14,15] Egmond, Groen and Jongkees,[6] Groen,[7] Rossberg,[16] Boenninghaus,[3] Keser,[12] Henriksson,[9,10,11] Stahle[17]). Egmond and his colleagues[6] pointed out that there is a direct proportion between the cupula deflection and the speed of the slow component. Rossberg[16] demonstrated that the speed of the slow component shows a considerably more constant pattern during the vestibular response than does its amplitude, which may vary from one jerk to the other within fairly wide limits.

In 1955, Henriksson[9,10,11] developed a method of electronystagmography by means of a modified electrocardiographic system which records the speed of the slow component directly by proper selection of the time constant and by rectifying the corneoretinal potentials. In this manner, the speed of the slow component of induced nystagmus may be automatically recorded and presents a characteristic curve as a function of time. These derived and rectified tracings were similar to the curves published earlier by Boenninghaus[3] and Dohlmann.[5]

In case the cupula deflection has a linear relationship to the speed factor of the effector organ, the relationship between stimulus and reaction, which is the basic question in all sensorial investigations, can very simply be evaluated by determining the turning speed of the nystagmic response. Therefore, the graphic plot of turning speed as a function of nystagmus duration is named the *vestibulogram*. With this terminology we also want to distinguish the specific graph of the speed factor from any other type of nystagmogram as obtained by the various methods described in the literature.

The importance of the turning-speed curve is demonstrated in figure 3. It shows a normal response to the described caloric stimulation. It is important to note that the frequency and amplitude values show changes of two different types:

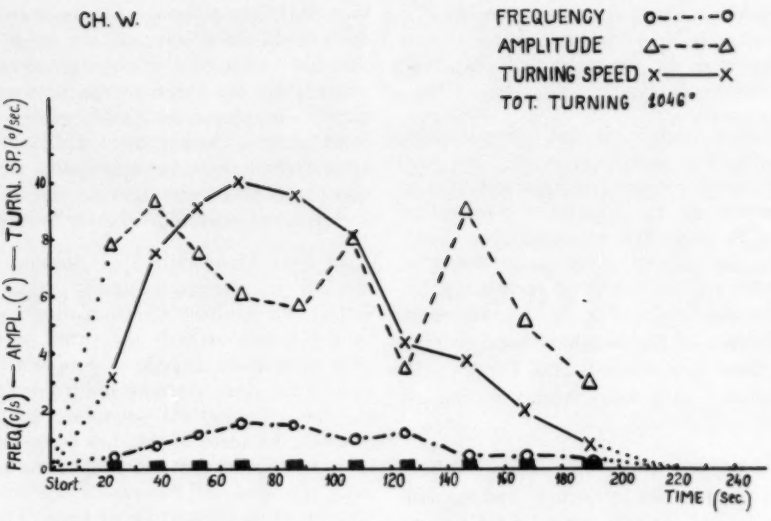

FIG. 3—*Normal turning-speed curve.* Symbols are the same as in figure 1. Total turning: 1046 degrees. Note the interdependent oscillations of the amplitude and frequency curves.

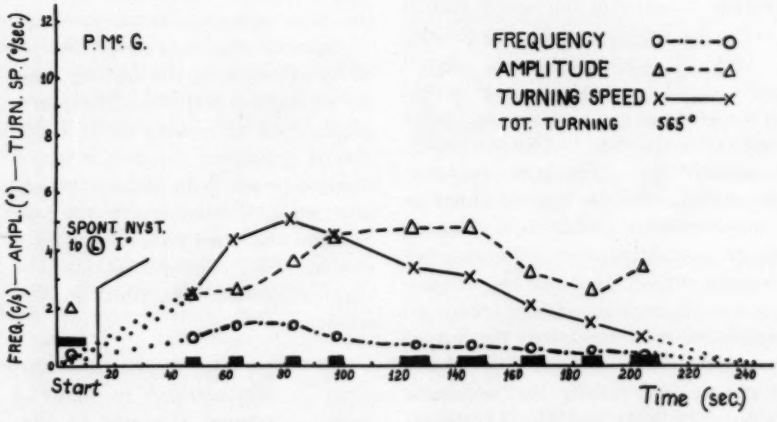

FIG. 4—*Vestibulogram in a case of progressive hereditary inner ear lesion.* P. McG., 19, student. For the past six months, gradual deterioration of hearing which started in the right ear. Deafness and deafmutes occur in the family history. Recruiting perceptive hypoacusis in both ears. Caloric test (Kobrak-Veits: right side, 90″; left side, 85″) and turning test (Barany: to the right side, 23″; to the left, 21″) showed values within normal limits. Symbols are the same as in figure 1. Total turning, 565 degrees. The values of spontaneous nystagmus (1°) are plotted on the left side of the graph: △ = amplitude; o = frequency; ■ = turning speed.

(1) *Independent changes:* Both curves present an ascending and a descending slope. These may have different courses for various subjects and reactions.

(2) *Interdependent changes:* For the same subject and during the same reaction, the amplitude and frequency curves show irregular deviations in directions opposite to each other. It can be seen in figure 3 that the frequency decreases when amplitude rises, and vice versa. The amplitude and frequency of the nystagmus are, therefore, not independent qualities and each one alone can hardly be employed for measuring the nystagmic response to a vestibular stimulation.

However, the product of the amplitude and frequency, i.e., the turning speed, shows a fairly regular course for the caloric vestibular stimulation. The interdependent and accidental amplitude and frequency variations are equalized in the turning-speed curve (fig. 3). Its slope presents a gradual rise to a peak during the first third of the reaction period, then a gradual decrease in the final two thirds of the reaction period.

We gained the impression that the peak part of the turning-speed curve is determined chiefly by variations of the nystagmus amplitude. Towards the end of the reaction, however, the frequency pattern is the more important component. Whereas the frequency curve fades away gradually, the amplitude curve may remain on a constant plateau, as was observed in several cases (fig. 4).

The turning-speed curve describes the nystagmic response in two dimensions (figs. 1, 3, 4):

1. The *time factor* is its duration along the horizontal time axis.

2. The *"intensity" factor (intensity of nystagmus)* is defined by the vertical axis, the value of the turning speed. The value of turning speed may be employed in the same manner for quantifying the *intensity* of any spontaneous nystagmus (fig. 4).

The duration and the "intensity" factor together describe the vestibular response. It has been suggested that the *amount of vestibular response* (to be distinguished from the "intensity" of the nystagmus) *is quantitatively defined by the product of both; that is, by the territory of the turning-speed curve.* This is the *total turning* of the nystagmic eye movement as it has been described before. The total turning of the eye defines the quantity of a given vestibular response and is expressed in number of degrees.

Figure 5 gives examples of what the changes in the turning speed mean. The left graph shows all three curves for a normal caloric reaction. On the right side, three types of abnormally reduced vestibular reactions are shown:

1. *Flattened vestibulogram:* Normal total duration; reduced total turning; no peak, but a large plateau with reduced turning-speed values.

The first type is seen in several subsequent vestibulograms with various depressions of the peak. This type of abnormality is revealed only by the vestibulogram. Routine vestibular testing cannot demonstrate such changes, because only the intensity of the nystagmus is reduced, and not the total duration.

2. *Concentrically reduced vestibulogram:* Reduced total duration; reduced total turning; reduced turning-speed values. The turning-speed curve is regularly shaped, but of a diminished size.

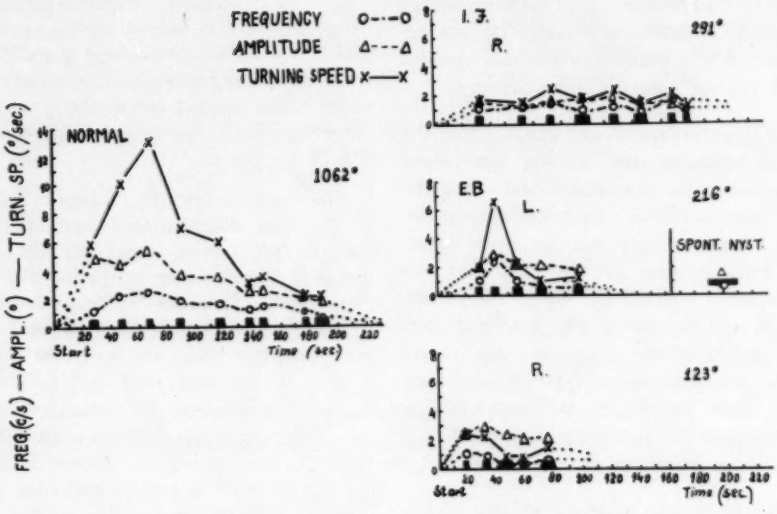

FIG. 5—*Types of abnormal vestibulogram.* Symbols are the same as in figure 1. On the left side: *normal* vestibulogram with the respective frequency and amplitude curves. Total turning, 1062 degrees. On the right side (from top): I. *Flattened* vestibulogram: normal total duration, reduced turning speed and total turning (291 degrees). Sudden hearing loss in the right ear, with one attack of vertigo, six years ago. Continuous hypoacusis and tinnitus. No spontaneous vestibular symptoms. Warm and cold caloric tests, as well as the turning test, show values within normal limits. II. *Concentrically reduced* vestibulogram: normally shaped curves of reduced size. For the past five years, gradual deterioration of hearing with tinnitus in both ears. Recruiting perceptive hypoacusis. No dizziness. Slight spontaneous nystagmus with values plotted on the right side of the graph: Δ = amplitude; o = frequency; ■ = turning speed. Caloric and turning tests showed values within normal limits. Total turning: 216 degrees. III. *Flattened* vetibulogram with *reduced* total duration. For the past year, hearing impairment and tinnitus in the right ear. Perceptive hearing loss. Left ear normal. No dizziness. No spontaneous vestibular symptoms. Caloric and turning tests showed values within normal limits but slightly less for the right ear as compared to the left. Total turning: 123 degrees.

TABLE I

AVERAGE NORMAL VALUES OF TURNING SPEED AND TOTAL TURNING FOR CALORIC STIMULATION WITH 10 CC. OF COLD (70° F) WATER INJECTED INTO THE EXTERNAL AUDITORY CANAL WITHIN 10 SECONDS (21 CASES)

	TOTAL TURNING IN DEGREES		TOTAL DURATION FROM THE START OF STIMULATION IN SECONDS	PEAK OF THE CURVE REACHED AFTER + SECONDS	TURNING SPEED AT THE PEAK OF THE CURVE IN ° / SEC.	
	MM.	MM.^{2}			MM.	MM.^{2}
Mean	825	870	218	60.5	8.8	9.5
Median	783	850	212.5	60.0	8.5	9.33
Standard Deviation	±263	±287	± 31.8	±10.04	±3.32	±3.76
Stand. Error of Mean	± 56.2	± 62.7	± 6.95	± 2.23	±0.73	±0.80

3. A combination of the previous two abnormalities: *Flattened curve with reduced total duration.*

For a preliminary evaluation, our first 70 test results were divided into three groups:

1. *Normal Vestibular Reaction*

The average values of the normal vestibulogram for 21 ears are shown in table I. According to the statistical evaluation, the total turning has a fairly wide normal range, just as the routine vestibular tests by rotation and calorization produce normal results within fairly wide physiologic margins. In figure 6, one of the strongest reactions obtained (total turning 2181 degrees) is compared to the reaction measured on a trained air force pilot (total turning, 651 degrees). Figure 7 shows differences

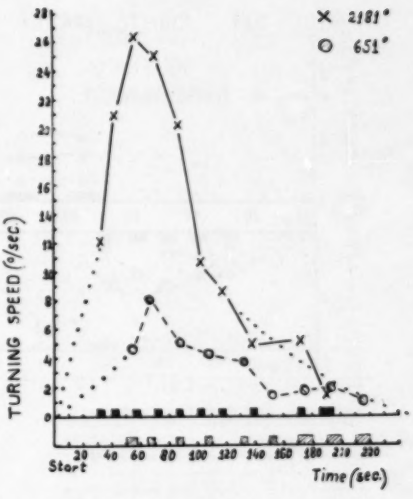

FIG. 6—*Normal vestibulograms* for two normal persons with marked difference of response. (a) x——x: M. D., 55, operator; total turning: 2181 degrees. (b) o - - - o; Ch. S., 36, trained air force pilot; total turning: 651 degrees.

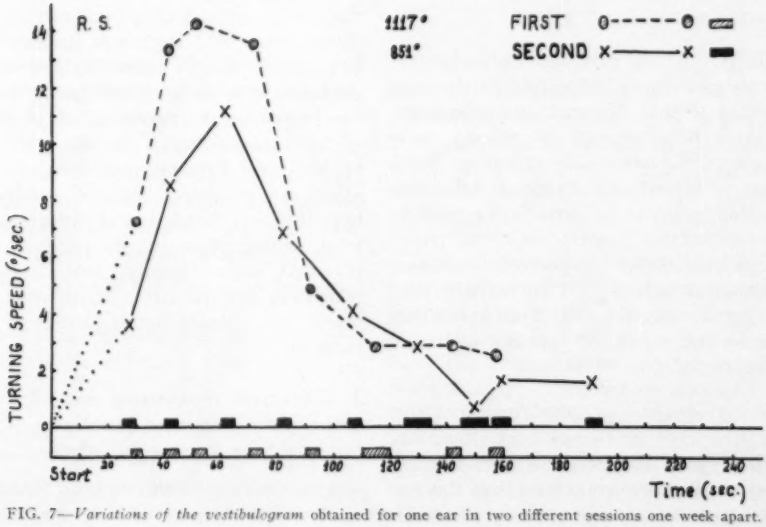

FIG. 7—*Variations of the vestibulogram* obtained for one ear in two different sessions one week apart.

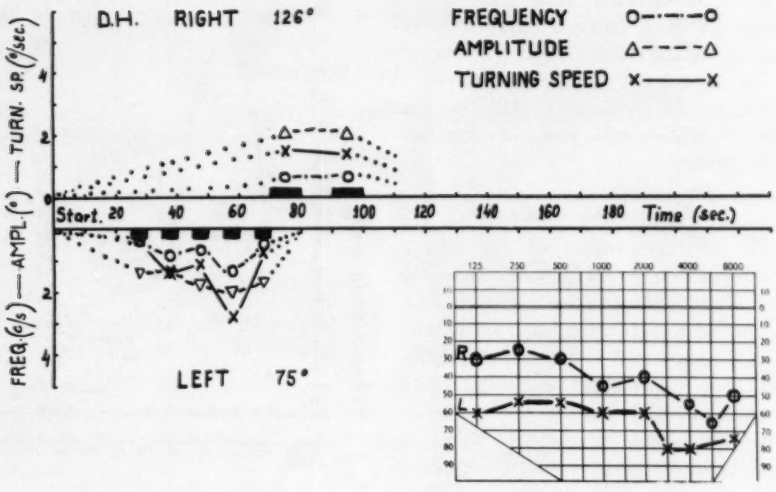

FIG. 8—*Abnormal vestibulogram.* D. H., 33, clerk. Congenital syphilis with reappearance of positive Wassermann reaction. Perceptive hypoacusis for the past three years. Periodic tinnitus. No dizziness. No spontaneous vestibular symptoms. Blind-walking on wider base with deviation to the left. Caloric test (Kobrak-Veits): marked reduction in both ears (45″ and 25″). The reduction is stronger in the left ear. Turning test (Barany): only a few beats. The vestibulogram for the right ear is plotted upward (total turning, 126 degrees), and the one for the left downward (total turning, 75 degrees); marked reduction on both sides. The respective audiogram (right ear: o——o; left ear: x——x) is shown in the right lower corner. For other symbols see legend of figure 1.

for the same ear in two sessions a week apart.

It is obvious that the vestibular apparatus may respond within fairly wide normal limits. Normal individual responses may present an equally wide range of differences, as is known from cases of seasickness. It appears that the vestibulogram is so sensitive a recording method that it measures all the physiologic variations of normal vestibular reactions which depend on variably sustaining or inhibiting central influences and on the individual training and conditioning of this organ.

When evaluating abnormalities, the comparison of the two ears, i.e., the comparison with the person's own normal reaction, is more important than the relation to some average normal values. At the present stage of our investigation it may be assumed that a total turning reduced below 500 degrees is suspected of being abnormal. A reduction below 300 degrees seems to be definitely abnormal. In comparing the two ears, a reduction of the total turning of one ear below 0.5 of the total turning measured on the other ear is also a sign of vestibular hypofunction. No binaural difference of total turning exceeding the ratio 0.7 was obtained, either among our cases of bilaterally normal ears, or between the results of repeated investigations of the same ear.

2. *Ears with Hypoacusis and Shortened Nystagmus Duration Detected with Routine Vestibular Tests*

Nine ears in this group showed marked reduction of turning speed, am-

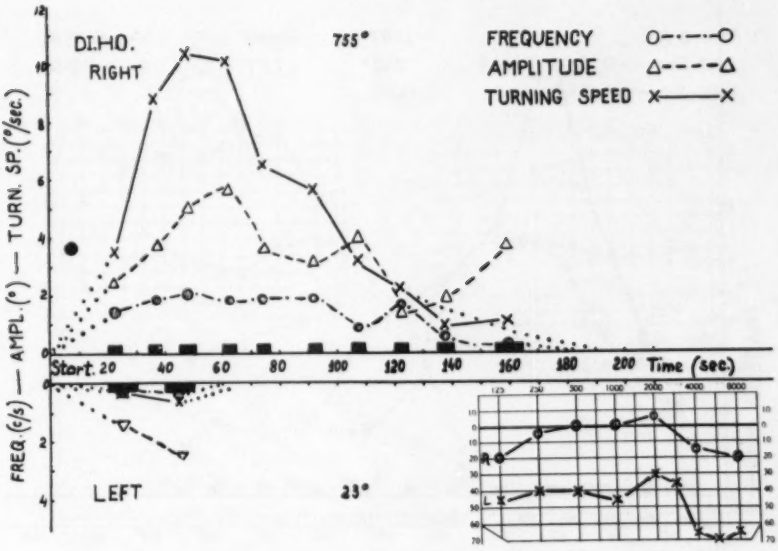

FIG. 9—*Abnormal vestibulogram.* Di. Ho., 57, female. Sudden hearing loss one year ago. Increasing tinnitus. Hearing loss in the range of regular presbycusis in the right ear. Vertigo: monthly, from 5 to 7 attacks for about 10 minutes. Turning test, both ears within normal limits. Caloric test (Kobrak-Veits): normal duration (85″) in the right ear and marked reduction in the left (50″). Turning test (Barany) gave results within normal limits. Vestibulogram for the right ear is plotted upward (total turning is normal, 755 degrees), and the one for the left downward (total turning, 23 degrees); marked reduction for the deaf ear. The respective audiogram and symbols are plotted as in figure 8.

plitude, frequency, total duration, and total turning, resulting in some form of abnormal vestibulogram, as has been described above. This reduction was analogous to that found in routine vestibular tests. However, the proportional reduction of the total turning was much more pronounced than that of the total duration (figs. 8 and 9).

3. *Ears with Hypoacusis and Normal Results Obtained with Routine Vestibular Tests*

Among the 36 ears in this group, 8 presented remarkably reduced vestibulograms, in spite of the normal results obtained with routine vestibular tests. Five such cases of unilateral deafness are of particular interest. In these cases, the presence of the lesion in the organ of Corti points to the damage of the vestibular apparatus, thus substantiating the abnormal vestibulogram (figs. 10 and 11).

It is obvious that routine vestibular tests could not reveal any abnormalities in these cases because they are based on the determination of nystagmus duration. The respective vestibulograms also show total durations within normal limits which are almost equal in the normal and in the deaf ear. However, the turning speed of the nystagmus and the values of the total turning were found markedly reduced on the affected side

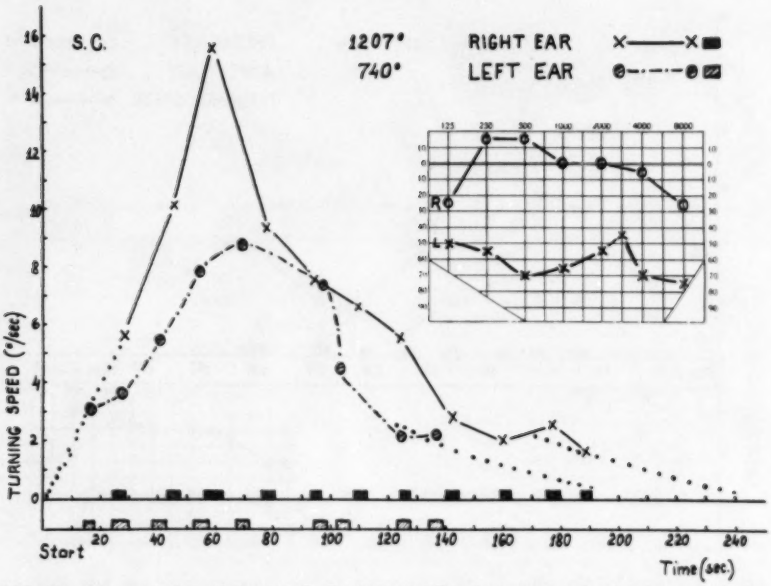

FIG. 10—*Asymmetrical vestibulogram.* S. C., 44, male. For the past year, hearing loss and tinnitus in the left ear. Hearing on the right side normal, on the left side recruiting perceptive hypoacusis. No dizziness. No spontaneous vestibular symptoms. Caloric test (Kobrak-Veits) and turning test (Barany) showed values within normal limits. Marked difference of vestibulogram and total turning between the normal (x——x) and the deaf ear (o-.-.-o). Audiogram symbols are plotted as in figure 8.

(a reduction below 0.55 as compared with the normal ear). This sign is suggestive of a vestibular lesion, which may have been hitherto undetectable by routine vestibular testing.

Further examinations should help to evaluate the significance of the different types of vestibulogram. Our present investigation served mainly to establish new principles for a practical vestibular test rather than to achieve final data by this test. The determination of speed offers a very sensitive and fruitful method for defining quantitatively the nystagmic response to vestibular stimulation, the result of which can be presented in an easily understandable graph. Both spontaneous and reactive nystagmus can be quantified in the same terms. Our present method is based on fairly difficult and time-consuming computations which contain several sources of error. However, with the advance of electronics, it is easy to construct a suitable apparatus automatically recording the vestibulogram in the form of curves which are analogous to our demonstrated figures.

SUMMARY

The basic process of a vestibular reaction is the cupula deflection which seems to determine the speed of the slow nystagmus phase. The registration of this speed has been achieved by some authors by means of especially designed equipment or by computation. Employing standard EEG equipment, we de-

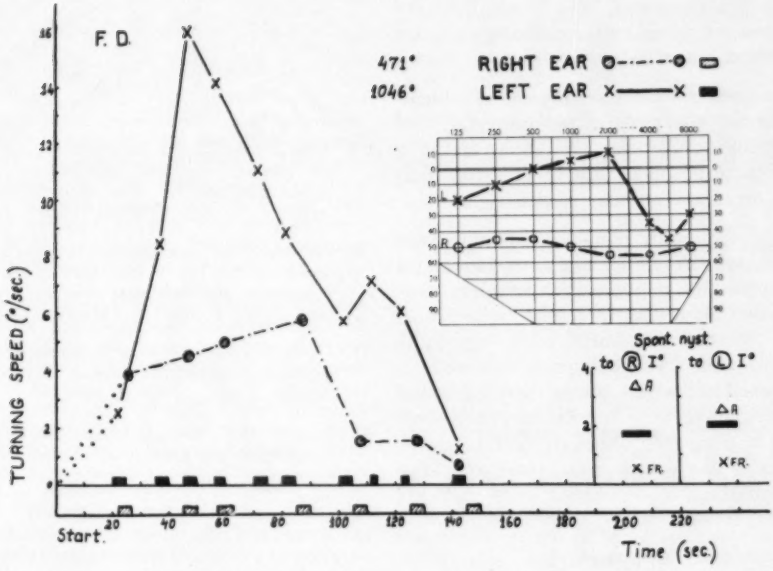

FIG. 11—*Asymmetrical vestibulogram.* F. D., 42, salesman. For the past seven years, tinnitus and hearing loss in the right ear. Facial skin lesion suggestive of lupus erythematosus. Blood pressure, 170/110 mm. Hg. Left ear, 40 db dip around 6000 cps. Right ear, recruiting perceptive hypoacusis. Vertigo about once monthly for a half hour. Spontaneous nystagmus of I° in both directions (values plotted on the right side of the graph: Δ A = amplitude; X FR = frequency; ■ = turning speed). Caloric test (Kobrak-Veits) and turning test (Barany) showed values within normal limits. Marked difference of vestibulogram and total turning between the good (x——x) and the deaf (o -.-.- o) ear. Audiogram symbols are plotted as in figure 8.

veloped a method of recording and computation for the purpose of obtaining such speed values through the electronystagmographic registration of corneoretinal potential changes.

1. The determined speed values *(turning speed)* plotted as a function of nystagmus duration present a characteristic curve. In this curve, the amplitude and frequency of the nystagmus are summarized and their interdependent variations are equalized. The graph expressing the turning-speed curve is named *vestibulogram.*

2. The turning-speed curve (vestibulogram) describes the nystagmic response in two dimensions. It considers *total nystagmus duration* as only one component of the vestibular reaction, while the height of the curve indicates the *intensity of nystagmus.* The latter seems to be the more important trait. The determination of turning speed makes it possible to quantify spontaneous nystagmus in a similar manner.

3. *The magnitude of the vestibular response* seems to be defined by the area bounded by the turning-speed curve. It is called *total turning (total amplitude).* It indicates the number of degrees which would theoretically occur if the slow nystagmus component consisted of a continuous eye rotation.

4. The vestibulogram resulted in typical curves for the normal caloric reaction. The normal limits of total turn-

ing are discussed, and three different types of abnormal vestibulogram are defined.

5. Several cases are presented to demonstrate the sensitivity, simplicity, and significance of the vestibulogram as a practical graph for the quantitative definition of a vestibular response.

6. Especially remarkable results were obtained in some cases of unilateral labyrinthine hypoacusis in which no vestibular abnormalities could be revealed by routine vestibular tests. In these cases, the vestibulogram showed a marked reduction of the turning speed and total turning for the labyrinth with the hearing loss, although the total duration of the caloric nystagmus appeared normal.

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DISCUSSION

NICHOLAS TOROK, M.D., Chicago: In 1954 a motion picture dealing with graphic recording of vestibular nystagmus was shown

by us in an Academy meeting. Since that time, nystagmography has developed into an indispensable instrument in neuro-otologic examinations, and it is widely used in routine otological testing in various centers and clinics in Europe. This is the first time since 1954 that a paper based upon nystagmographic work in human subjects has been presented before this assemblage. Therefore, I welcome the authors of this paper, which reports a study applying nystagmography. I hope their effort will generate more well deserved interest in this revolutionary approach concerning our everyday vestibular problems.

In my experience, a graphic record is the simplest and most objective reproduction of the vestibular nystagmus. It is true, however, that EKG or EEG machines are not adequate for nystagmus recording. These instruments operate with a so-called time constant which is too small. Amplifying systems with a time constant at least as large as four seconds can produce records with great accuracy. A direct current amplification is by all means preferable. The photoelectric recording principles fulfill these requirements. No elaborate computations are needed to evaluate frequency and amplitude patterns. The graph can be read directly.

What is readable in a nystagmogram? First of all, the duration of the nystagmus. This is the only factor available for its unaided observation. But the graph presents further information of great value: The number of eye oscillations and the magnitude of the excursions can be studied. Finally, the angular velocity of the slow component, which is the primary vestibular reflex, becomes measurable.

The authors integrate the frequency and amplitude behavior of the postcaloric nystagmus and use the terms "turning speed" and "total turning." The "turning speed" seems to me another term for the angular velocity of the slow component, first described by Hallpike and Hood in 1953, and recorded directly by Henriksson in 1955. What the authors call "total turning" was first recommended by Mittermaier in 1952 and called "total amplitude."

As for plotting the frequency in time intervals, in 1948 we found that the frequency of the postcaloric nystagmus is not a steady phenomenon. It rapidly reaches a characteristic peak shortly after the reaction begins. This was called the culmination phenomenon. It is gratifying that the authors followed the same idea and obtained the same result. To express the very characteristic culmination phenomenon in a simple way, a tabulation of the nystagmus frequency was used, and we presented this tabulation before the International Congress of Otolaryngology in Washington. The record was named "thermogram" because it was obtained through thermic stipulation of the labyrinth. Miskolczy-Fodor and Arnold, integrating the amplitude behavior with the frequency analysis, use a new term, "vestibulogram."

I agree that the frequency and the amplitude are interdependent qualities of the vestibular nystagmus. An integration of these may be arbitrary. Much more clinical evidence is necessary to prove the usefulness of the vestibulogram.

Lastly, I want to ask whether the authors recorded and evaluated the first-degree postcaloric nystagmus, or were the observations directed only toward the second degree, i.e., the mid-position eye movements. In certain pathologic cases considerable difference may exist in this respect, and disregarding the first-degree postcaloric or postrotatory nystagmus may lead to erroneous conclusions.

DR. FODOR: We sincerely appreciate Dr. Torok's discussion and his interesting suggestions. At this time we wish to reply to only two comments.

The results just presented described the recording of nystagmus only in the central eye position (nystagmus of second degree). Since our subjects are examined in a dark room while wearing Frenzel goggles, we would encounter technical difficulties if we tried to determine the degree of eye deviation of a lateral gaze. Unless a standardized measure of a lateral eye position is applied, a new uncontrolled variable would be introduced into the nystagmus pattern.

We found it particularly valuable to express both the frequency and amplitude, as well as the turning speed pattern, of a particular nystagmic reaction. However, it is our aim to simplify the final evaluation of electronystagmographic records, employing only a few quantities for defining the nystagmic pattern. We feel that the registration and evaluation of the turning speed pattern is the more important factor and that it is sufficient for routine evaluation of nystagmus. The interdependent variability of frequency and amplitude is eliminated by calculating their product, which is the turning speed.

EMERGENCY AIRWAY BY CRICOTHYROID PUNCTURE OR TRACHEOTOMY

A Comparative Study of Methods and Instruments

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ENTERING the airway in time of medical need has been a soluble issue only since Habicot's interventions reported in 1620. "Notoriously simple on the cadaver (or dog, we might add), it can be one of the most difficult procedures in surgery," so Guthrie[5] properly describes the tracheotomy in his historical study. Goodall's exhaustive treatise[4] confirms this generalization throughout the history of the ideas, methods and instruments, and results of entry into the airway by all routes. In recent years there has been a pronounced extension of the indications for the performance of tracheotomies under a multitude of surgical and medical situations. These have been admirably summarized in the review and research by Nelson[10,11] of the Army Medical Corps (1957). Military medicine, represented by such workers as Ziperman[16] and his associates, has an intensified concern for the handling of combat casualties by aides, nurses, and nonsurgeon physicians. The current possibilities for mass disaster have further intensified the search for simpler and more practical methods for producing an emergency airway when it may be indicated.

Many decades of surgical experience have shown that in an emergency, however difficult the problem, the surgeon trained in any one of many specialties can enter the airway either at the cricothyroid membrane (laryngotomy) or through the anterior wall of the upper trachea, performing this entry with instruments at hand. This comparatively simple procedure is performed with a surprising multiplicity of methods and instruments but with certain common denominators. A majority of the recommended methods have been devised by surgeons ostensibly for nonsurgeons but, in fact, with the unconscious assumption that potential nonsurgeon tracheotomists are as familiar with the surgical anatomy of the neck as are surgeons, that they are as skillful with instruments, and that they enjoy surgical confidence. There is no generally accepted "best" method of entry, although the Jackson[8] and Nelson[10] recommendations are close to elemental.

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PRINCIPLES OF COMPARATIVE STUDY

If methods for tracheotomy are to be devised which are realistically usable by the nonsurgeon, the criteria will include speed of entry, short-term and long-term safety to the patient, an adequate and easily maintained stoma when an entrance has been achieved, simplicity of methods and instruments, and such confidence in his ability to succeed with safety that the prospective tracheotomist will actually attempt relief of airway obstruction when the signs and symptoms are manifest. It should be emphasized, of course, that the primary consideration is to know *when* to perform an emergency tracheotomy. The established indications are not here considered. Nor are the equally important factors of proper aftercare. Proper and satisfactory techniques are alone at issue. Since "there are no contraindications to tracheotomy,"[8] the hazards attendant upon delay in performance may perhaps be mitigated by optimal technique.

In developing a comparative study of emergency airway methods, following preliminary work certain principles were defined.

1. Our concern was with acute field *emergency* airway production only. Orderly *elective* and hospital "emergency" tracheotomies were considered to be within the competence of trained otolaryngologists and other surgeons and not of primary concern to us.

2. True emergencies calling for an opening into the upper airway may infrequently involve physicians who are nonsurgeons, dentists, nurses and medical aid personnel. Therefore, the proper test subject was the nonsurgeon, relatively unskilled, even clumsy, lacking confidence, nervous, tense, forgetful and unsure of his detailed neck anatomy. Methods and instruments had to pass muster by functioning easily and well in such hands at the time of each *first* tracheotomy. Considering the relative rarity of this emergency in any one normal medical lifetime, and the comparative surgical simplicity of the procedure, the *first* performance was considered the true appraisal of any method's effectiveness.

3. In emergencies too urgent to permit transportation to a hospital operating room, entry into the airway through the cricothyroid membrane appeared to be the most direct, simplest and most rapid of execution, and the least likely to produce excessive bleeding and/or damage to the thyroid gland, the great vessels and nerves of the neck, and the esophagus. It is assumed that intubation will not be skillfully employed. The cardinal objection to cricothyrotomy, of course, is the reported hazard to the cricoid ring from instrumental injury or from the long-sustained pressure of cannulas kept in place for many hours, usually coupled with local infection.[6,10] A somewhat compensating merit is that there is less hazard to the esophagus because of the solid shield of cricoid cartilage posteriorly. Current recommendations call for early elective low tracheotomy in the hospital within 24 to 48 hours if a long-functioning airway is judged to be necessary.

4. Entry into the trachea proper appeared to be a distinct second choice for nonsurgeons in the dire emergency situation. The presence of "the negligible thyroid isthmus" (Jackson[8]) and the deeper-lying position of the trachea were the principal obstacles. However, the usefulness of emergency cricothyrotomy instruments should be considered for potential application to the lower trachea under circumstances in which this might be necessary. Therefore, instruments should be tested for this function.

Preliminary observations* suggested that none of the instruments presently offered for use was likely to prove satisfactory for the nonsurgeon, although doubtless each one functioned adequately in the hands of its innovators. On cursory classification, the instruments fell into four groups: knives with cannulas, trocar-cannula combinations, dagger-dilators, and a miscellaneous group including knives alone and needles alone.

GENERAL METHOD

Each instrument and method was tested first upon anesthetized survivor dogs with an average weight of 9 kilograms by some member of the Department of Otolaryngology or by a trained surgeon operating according to instructions supplied with the instrument in question or sometimes simply being handed the instrument to use as it seemed logical to handle it. Procedures were filmed for later analysis and comparisons. Later, a nonsurgeon, usually a preclinical medical student, was brought to the laboratory unwarned and unsuspecting and, following a very brief period of instruction, was asked to undertake an emergency procedure upon an airway-obstructed animal. This, too, was often filmed for later analysis. During all procedures, observers made notes of performances, seeking to assess the merits and demerits of the instruments under observation. At intervals, instruments were observed in action and filmed through the severed trachea from below in order to identify the hazards in the use of particular instruments.

Dogs and cadavers were employed for cricothyrotomies, human subjects for tracheotomies. Testing upon human volunteers for cricothyrotomy and upon hospital emergency patients requiring tracheotomy should follow the study reported here.

EXPERIMENTS ON THE DOG SUBJECT

A. *Anatomy of the Dog Neck, with Special Reference to Tracheotomy Approaches*

When shaved and draped the external appearance of the dog neck grossly resembles a human neck. This mimicry lends itself usefully to experiments with human test subjects whose psychological reactions are important factors in performances.

The skin is not significantly looser or tougher than the human skin over the cricothyroid membrane. However, the strap muscles are thicker in the dog; therefore, palpation of the cricothyroid space is somewhat more difficult than in the human. The cricoid ring is larger and more prominent but the thyroid cartilage is correspondingly less prominent than in the human male. The anatomy of the neck of the dog is closer to that of the human female or child structures. Otherwise the cricothyroid membrane, cricothyroid muscles and cricothyroid area *in toto* are rather similar to those of the human.

The tracheal area in the dog is somewhat more contrasting. There is no thyroid isthmus; the gland exists as two lateral independent structures. The trachea is longer, looser and more superficial in position, easier to grip and fix in the fingers. The tracheal rings are more closely spaced. By contrast, the human trachea dives deeply into the root of the neck following the cervical spine and is much shorter and less accessible. Patient positioning is correspondingly more important.

*Observations were made at first incidental to the production of a teaching film sponsored by Pfizer Laboratories, Chas. Pfizer & Co., Inc. The studies undertaken are now the basis for that teaching film, soon to be completed.

In total, the dog appears to be an animal adequate for preliminary experiments in emergency airway methods.

B. *Surgical Anatomy of the Human Neck, with Reference to Tracheotomy Approaches*

1. *The anterior aspect of the human neck* externally presents certain familiar landmarks: (a) the notch of the thyroid cartilage, particularly prominent in the male, (b) below it the prominent anterior curve of the cricoid cartilage, (c) the sternal notch at the root of the neck, and (d) laterally, the jugular-carotid grooves between the sternomastoid muscles and the larynx-trachea column. The skin investure over this anterior aspect is everywhere loose and slightly redundant.

2. *The region of the anterior thyroid and cricoid cartilages, and the cricothyroid space.* In terms of the surgical anatomy of the anterior cricothyroid region, one must indicate the relative ease of fingertip identification (even in a baby) of the cricothyroid space between the palpable midline thyroid notch, the Adam's apple, and the cricoid cartilage prominence. Below the loose skin layer there lie the subcutaneous tissue and investing superficial cervical fascia. The thyrohyoid, omohyoid and sternothyroid muscles lie slightly laterally. In the dog the strap muscles meet in a broad thick band at the midline. In the human the thyroid and cricoid cartilages are sheathed only by skin and fascia in the ventral midline. The elliptical cricothyroid space is spanned by the cricovocal membrane, or conus elasticus, which extends from the arytenoids posteriorly to form a membranous arc anteriorly. Average useful dimensions of the space are 0.5 to 1.2 cm. vertically at the midline, and 3 cm. transversely.[1] Its anterior median segment is the triangular cricothyroid ligament, thick, strong and elastic, whose apex is superior and attached to the center of the thyroid cartilage base. This ligament is relatively avascular anteriorly. The cricothyroid muscles lie laterally, arising from the lateral arches of the cricoid, and inserting along the lower outer margins of the thyroid. Arterial supply to the muscles and other structures about the space derive largely from the cricothyroid artery, fourth branch of the superior thyroid artery. The venous return flows into the anterior jugulars on either side of the midline. In general, the veins are associated with the lateral muscle masses and are not found close to the midline; occasionally, large veins cross the midline but there should never be dangerous bleeding in this area. There are small anastomotic branches of both arteries and veins running across the midline at the membrane or close to it.

Anteriorly at this level, the mucous membrane of the larynx is thin and attached tightly to the cricovocal membrane and cartilages by submucous tissue.

Posteriorly, the cricoid cartilage presents a broad bar of cartilage 2.5 cm. in vertical dimension and extending superiorly to the articulations with the arytenoid cartilages. Forceful perforation of the cricothyroid membrane with an instrument traversing the trachea usually means impact near the center of the posterior arch of the cricoid cartilage, well below the arytenoids, and 1.3 cm. below the plane of the true vocal cords.[1]

3. *The region of the cricotracheal space.* Beginning below the cricoid are the tracheal rings, incomplete posteriorly over the esophagus. Arching over the bottom of the first ring and variably extending to the third ring is the isthmus of the thyroid gland. In the baby, the isthmus may extend upward to overlap the cricoid cartilage. Glandular branches

of the superior thyroid artery lie along the upper margin of the isthmus, and there are parallel veins.

At the midline in the adult there are only skin, cervical fascia, the elastic cricotracheal ligament and the internal submucosa and mucosa to penetrate. The space is narrow. The thyroid isthmus and its large vessels is hazardously close. But the surgical anatomy of the area does permit an approach, if only in error.

4. *The upper trachea.* The *c*-shaped tracheal rings, incomplete and flattened posteriorly, begin below the cricoid and are palpated with some difficulty in the human because the tube follows the curvature of the spinal column posteriorly. The third and fourth tracheal rings, below the thyroid isthmus, are the target of classical tracheotomy. Skin and cervical fascia are the essential structures to be passed through in the midline. The sternothyroid muscles here come close to approximation. Below the thyroid gland the inferior thyroid veins of both sides descend into the mediastinum, anastomosing widely over the anterior surface of the trachea into what sometimes comprises a plexus, and bleeding may be troublesome.

C. *General Considerations Governing Tracheotomy*

1. *Positioning* of the subject for tracheotomy. It should be re-emphasized that the dog (or patient) must be positioned with the neck straight and moderately hyperextended and the shoulders supported and raised. The chin must be held straight in the median plane and pulled cephalad if required. In short, the airway should be exposed in the optimal position and made as accessible as possible without real discomfort.

2. *Lighting* should be the best possible. Ideally, one should be able to perform this emergency procedure blindfolded or in the dark. Realistically, full vision is crucial, particularly for the timorous nonsurgeon.

3. *Post-tracheotomy positioning.* Following entry into the airway, the subject should be positioned for comfort, but the head should be low to prevent drainage of any blood downward into the lungs, and also to permit drainage of secretions and blood by suction or gravity.

D. *Comparative Observations of Methods and Instruments*

1. *Needles.* A hollow needle has been suggested for generations as an emergency airway. Although it is easy to force a needle into the trachea, commonly available needles are of a diameter too narrow to preserve life even in an infant. Furthermore, they are very easily blocked by secretions. In our hospital, no. 15 needles were the largest size readily discovered. The no. 13 Shelden needle, the largest we have utilized, would appear to be inadequate for air exchange even in an infant (fig. 1).

When needle diameters enlarge they become cannulas. But forcing a pointed and edged giant needle through skin and tissue creates the dangers of daggers *(vide infra)*. Two curved cannulas with an external diameter of 10 mm. were shaped with thin tips angled in opposite directions; each tip was pointed and the forward edges were sharpened. These cutting and stabbing cannulas could be forced through the cricothyroid membrane with hard pressure. However, such pointed tips and cutting edges inside the airway when the cannula is indwelling suggest hazards to the trachea with coughing, spasmodic movements, etc.

2. *Cannulas* are, of course, usually employed to exploit the openings into the airway produced by many of the instruments described below (fig. 1).

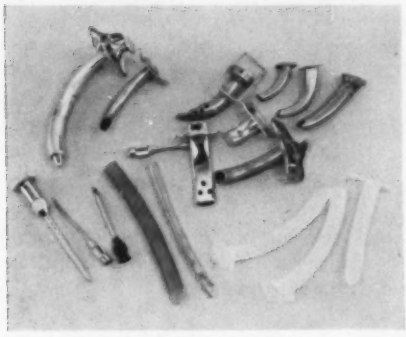

FIG. 1—Cannulas and needles.

Throughout the comparisons of those instruments, when cannulas were not an intrinsic part of the instrument complex there was a steady alteration of the designs of the cannulas used with them. Denker and Caparosa cannulas have been designed specifically for the cricothyroid space. The Shelden cannula is modified slightly from the standard for its special use.

Our experiments first evolved a cannula whose distal opening was angled slightly to produce a dull pushing point. Its angle of perhaps 30° is so shallow that blockage against the endotracheal wall appears not to be likely, particularly in this relatively rigid tube. This design appeared to obviate the need for an obturator in pushing through narrow openings. Note that the common rubber endotracheal tube has an even more sharply angled tip. Expanding the tube taper toward a thicker base was suggested by the need to dilate and tamponade a bleeding stoma. Such a taper was effective for cricothyrotomies but of less significance in tracheotomies where the wound was large. The cannulas were shortened slightly from the Jackson design in order to avoid hazards from low placement in babies* but were kept longer than the Denker cannula in order to prevent too easy slipping out if used in tracheotomies. The bases were broad and classically slotted for umbilical tape tie strings.

A life-saving cannula small enough for a week-old infant will not sustain life in an adult. Conversely, a tube large enough for an adult cannot be forced into the infant trachea without dangerous trauma. However, cannulas in sizes 2 and 6 would appear to fit the wide range of emergency challenges in both infants and adults. These two conceivably can be nested together in an emergency kit or tray.

From experience with the Japanese bivalve cannula, whose performance is recorded later, a potentially "universal" cannula has been developed, utilizing lateral blades sprung so that they remain open, rather than closed as in the Japanese design. The blades are tapered from a 10 mm. base to 5 mm. width at the tips. The tips are angled to 30 degrees, the edges and points blunted to prevent cutting of tissue. When spread apart, a no. 7 inner cannula slips neatly between the blades. Such a bivalve cannula dates back to Bourdillat in 1852 and others who took up his idea in that early era of frequent cricothyrotomy.[2]

In using this cannula, the operator compresses the blades so that the tips meet. The point and edge then presenting can be thrust along knife or scissors blades into the stoma. The puncture instrument is withdrawn, the bivalve can-

*In one case of a baby in our hospital, a low-placed tracheal tube extended slightly beyond the carina and blocked off one bronchus, with dangerous consequences.

nula is forced into the airway as far as the internal diameter of the airway will permit. With finger pressure released, the blades spring apart as far as the tissue will tolerate, and the cannula becomes essentially self-retaining. Forcing the inner cannula into the outer bivalve sleeve as far as it will go provides dilatation of the stoma. Once dilatation has created a stable stoma, the external bivalve itself can be removed and the inner cannula, with its blunt angled tip, can be inserted by itself. Such a dilating cannula complex not only makes entry easy and reduces tissue damage but appears to reduce bleeding markedly.

For routine tracheotomies in the hospital, the wide range of standard cannulas available for all purposes can be supplied in such trays as the Maloney emergency tracheotomy set (Pilling, 1957).

(a) *Emergency Cannulas.* There are many tales extant, often true ones, regarding the emergency use of tubing of various origins, e.g., rubber tubing cut from a stethoscope, plastic tubing, broken-off or dismantled fountain-pen caps or barrels, and others. After seeking to re-enact these feats with home-collected materials, our conclusion is simply that they *will* work in the hands of tough-minded, deft and lucky persons. But there are many time-consuming failures in improvisation which might easily lose lives salvageable by other approaches.

3. *Knives and Scalpels.* As a class, all edged instruments in these categories are somewhat hazardous in the hands of nonsurgeons. Our "emergency" pocket-knives dredged from sundry pockets and drawers usually were less sharp than was required to cut skin readily (fig. 2). The application of pressure to compensate for dull edges produced long, freely bleeding slashes, not without danger to the external jugulars, the sternomastoids,

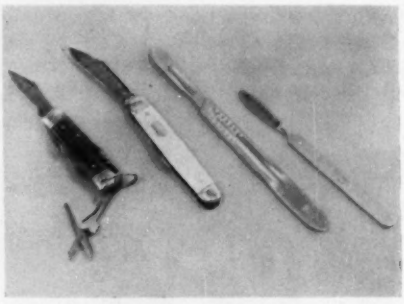

FIG. 2—Knives.

etc.,* and surely with cosmetic deformity. Saving a life need not be complicated with added insults.

(a) *Cricothyrotomy with Knives.* Transverse knife cuts through the skin may be followed by stabbing and/or cutting through the strap muscles, membrane and cricothyroid muscles. The vessels supplying and draining the muscles are sectioned, and there is almost always excessive bleeding, sometimes frightening to the nonsurgeon. Turning the knife blade to the side, supposedly to open a stoma, results only in cutting into new tissue if the blade is sharp. Air bubbles with difficulty through the slit and along the blade. Reversing the knife to hold the ostium open with the handle may be required. Last but not least, nonsurgeons in general appear to feel a singular lack of confidence with knife in hand, even though the old doctors' tales have given them a vision of flashing knives and thus have created a psychological pre-set.

(b) *Tracheotomy with Knives.* The traditional emergency tracheotomy by surgeons begins with a vertical incision

*Note details of the recent well-publicized story of an aged Minnesota doctor whose life was saved by his farmer sons with the aid of a paring knife and a pen barrel. (November 24, 1958, AP)

from thyroid notch to sternum made with conviction. A long, often freely bleeding wound provides the entry for bloody blunt dissection between the strap muscles, accomplished perhaps with the finger. Finally, semiblind entry is achieved into the deep-lying trachea, perhaps sectioning the thyroid isthmus en route. Any small knife with edge and point will suffice for a surgeon, although individual cases may be very difficult indeed.

4. *Knife-Cannula Combinations.* A cutting-stabbing knife blade combined with a cannula is an appealing possibility, since inexpensive watch-chain or key-ring units appear to be practicable. A good multipurpose pocket instrument meeting the criteria above might be devised if of value. Several new models were designed, of slip-in, screw-in, sliding-retracting, and switch-blade types (fig. 3). The spring-blade instrument of Delaney[3] is of this type. One screw-in

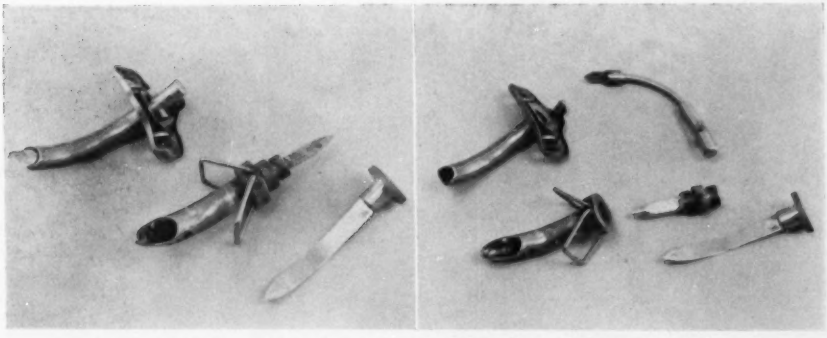

FIG. 3—Knife-cannulas. (Left) Assembled. (Right) Disassembled.

The safety razor blade is excellent for a skin-muscle incision, but quite difficult for tracheal section. Double-edged razor blades must, of course, be broken lengthwise for the operator. It is unfortunate that single-edged blades are today relatively uncommon, because they may be used with greater facility.

For the nonsurgeon, bleeding is invariably a confusing, obscuring, perhaps frightening issue, even though the midline tracheotomy is comparatively a bloodless operation from the surgeon's viewpoint. The pain to the patient, the poor visibility and hazard to the vascular thyroid gland make emergency entry into the trachea by knife difficult at best, a failure at least, for the nonsurgeon.

model of ours* has the blade sheathed by the cannula for easy pocketing. The blade is unscrewed, reversed and screwed in for tracheotomy so that the cannula serves as a handle.

(a) *For Cricothyrotomy* all these devices suffered from the common defect that they were knives in nervous hands cutting through surprisingly tough skin. When knives were used first for stabbing, additional cutting to widen the stoma was required. Using the new bivalve cannula, passage down a blade should be easier than with solid cannulas. There was troublesome bleeding

*Devised by Leo L. Leveridge, M.D., New York, N. Y.

and moderate damage to the cricothyroid muscles.

(b) *Tracheotomy* by nonsurgeons could be accomplished with these devices but with unhappiness, clumsiness, and some hazard to the patient (see 3 above).

Japanese tracheotomy kits of unusual design were recovered during the World War II Pacific campaigns.* Key to the functioning of this unit is a bivalve cannula with blades sprung to remain closed. A triangular knife affixed to a metal stem with handle slides through the slotted cannula base, separates the cannula blades, and is used for cutting or stabbing as may be required. Once entry has been made into the trachea, the bivalve cannula is left *in situ*, the knife is withdrawn and the solid inner cannula is inserted to spread the blades.

For tracheotomy in the dog, the instrument functions reasonably well, although the knife blade requires redesign for real efficiency. For cricothyrotomy, the triangular tip cuts too widely and destructively through the structures surrounding the cricothyroid space. However, for tracheotomy, the cannula is efficient and suggestive *(vide infra)*.

5. *Trocar-Cannulas.* The heavy dagger sheathed with its own cannula or the sharpened obturator tip is a traditional and familiar instrument for penetrating into body cavities. Three trocar-cannula tracheotomy instruments were appraised.

(a) The *Denker trocar-cannula* (fig. 4) appears to date to the diphtheria era in Germany and is designed solely for cricothyrotomy. Its design is sound. The trocar tip is sharp-edged and has a good angle for easy skin perforation. The cannula is short and ovoid in cross-section, the better to pass and fit the cricothyroid space. The handle is excellent, curved for wrist rather than for arm pressure. Fitting of the trocar-cannula sleeve is as precise as is mechanically practicable.

Nevertheless, during puncture the cannula edge catches upon the skin and underlying tissues as it seeks to follow the trocar tip. Passage is not only surprisingly more difficult than expected, but there is an explosive giving-way of

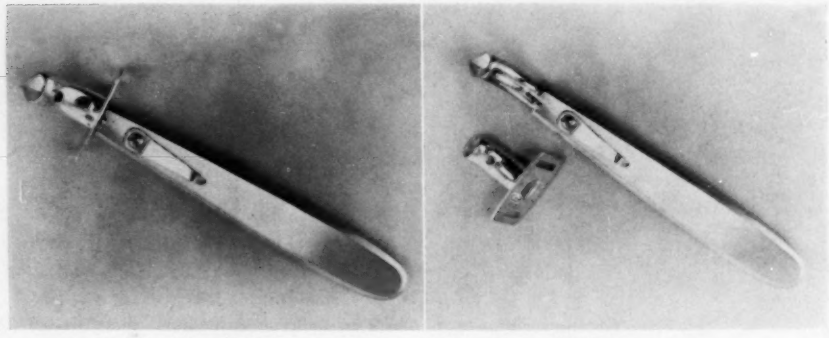

FIG. 4—Denker trocar-cannula. (Left) Assembled. (Right) Disassembled.

*George W. Mixter, Jr., M.D., New York University, supplied us with a kit salvaged during the Okinawa campaign. Exact source of the design is not known; allegedly, one Colonel Sato.

the skin edges when force is applied; this is damaging to the cricoid back wall. As with all trocar-cannulas the blind approach and necessary hard pressure create deep insecurity in the nonsurgeon.

(b) The *cricothyroid instrument of Caparosa*[1] has a trocar with a broad-angled spade tip somewhat reminiscent of a tiny Roman short sword (fig. 5). The cannula is flat and rectangular, of a shape designed for the transverse anatomy of the cricothyroid space which Caparosa has helpfully described following 51 dissections. Attached to the cannula base is a needle for an oxygen supply, if available. The handle is constructed for a full-hand grip.

In action the instrument invites powerful arm pressure upon the skin over the cricothyroid space. The broad-tipped blade is an inefficient stabbing device. When finally there is a sudden severing of the tough skin and the tissues below it, the blade is all too likely to bury itself in the back wall of the cricoid cartilage, perhaps may even penetrate the esophagus. With the relatively loose skin and tracheal structures, one must fear that some nonsurgeons will occasionally slip to the sides of the air tube and possibly sever neck vessels and nerves or will cut through the cartilages above or below if the blade is ill-directed. The blind approach and strong pressure provoke what appears to be a well warranted insecurity in surgeon and nonsurgeon alike.

Cricothyrotomy with this instrument was judged to be too hazardous even for experienced hands. Furthermore, so far it is available only in an adult size which is far too large for use when the patient is a child or infant.

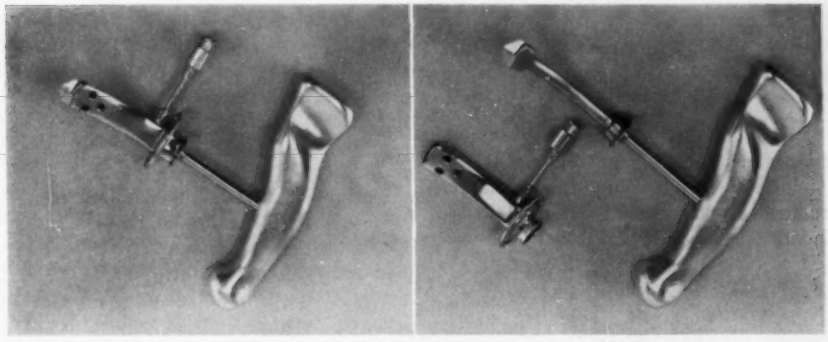

FIG. 5—Caparosa trocar-cannula. (Left) Assembled. (Right) Disassembled.

(c) The *Sierra-Shelden tracheotome* is the most ingenious, complex, and expensive of the modern trocar-cannulas (fig. 6). It is designed for tracheotomy only.[14] A no. 13 needle, longitudinally slotted, is forced into the tracheal lumen at midline below the thyroid isthmus, *circa* ring 2 or 3, until air is heard to pass through it. A unique 3-bladed cutting trocar with a small ball tip and sleeve cannula is threaded into the "safety guide" needle and forced down through the skin until the ball tip lies endotracheally. The needle is then withdrawn. The trocar with its tapered-tip cannula is thrust blindly into the trachea

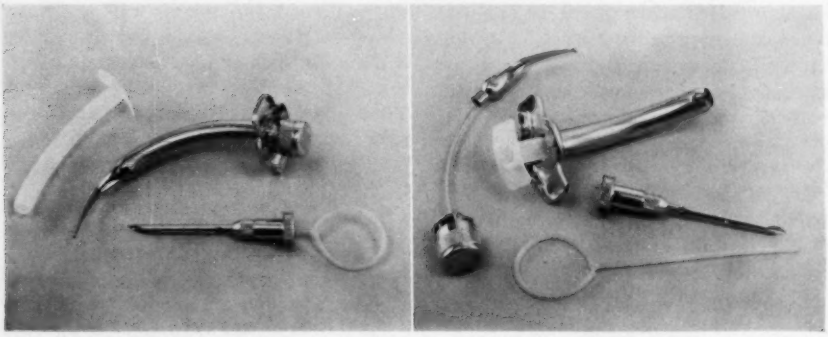

FIG. 6—Shelden tracheotome. (Left) Assembled. (Right) Disassembled.

until fully inserted, relying upon the small ball point to keep the trocar within the lumen. After the trocar is withdrawn, a plastic inner cannula replaces it.

In the hands of a skilled surgeon, the Shelden instrument functioned, but uncomfortably. The blind manipulation produced much feeling of insecurity. Endotracheally, the small ball tip was seen to pick up folds of the mucosa on the posterior wall where the rings are incomplete. Certainly there is hazard that the trocar may accidentally pierce the tracheal wall posteriorly or laterally. The cannula edges catch upon the skin in typical sleeve fashion and provide an obstinate resistance only overcome by more force than would appear to be desirable. A clear and unarguable advantage lies in the fact that successful passage of the trocar-cannula produces a new airway of "standard" type. No later operation is required, as with all cricothyrotomies. The cannula can be treated as a "permanent" tracheotomy tube, and the stoma should require no later revision. For use by surgeons in hospital practice, perhaps there is a role for this instrument, but its desirable features must be weighed against its hazards. For use as a disaster or combat first aid in-

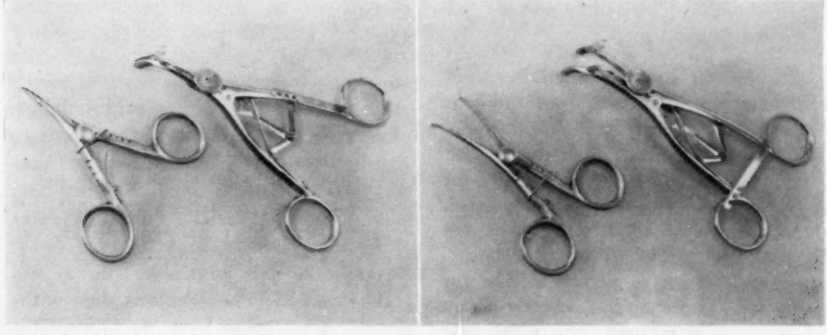

FIG. 7—Dagger-dilators. (Left) Closed. (Right) Opened. In both pictures the Stonecypher dagger-dilator is shown on the left and the Salvatore-Maloney instrument on the right.

strument, Ziperman and Thornton[17] have evaluated it using the adult mohair goat and consider it efficient and not prohibitively dangerous; perforation of the tracheal wall occurred in 2.92 per cent of their tests.

6. *Dagger-Dilator Instruments.* As suggested by several workers past and present, there is a valuable potential in the principle of a stabbing instrument capable also of dilating the stab-produced stoma into the airway.

(a) *Salvatore and Maloney*[13] have produced a most ingenious instrument for cricothyrotomy: a three-bladed surgical dilator with a small spring-retracting dagger grooved into one blade (fig. 7). When the blunt tip of the instrument is centered in the cricothyroid space, the dagger is punched through the skin; its edge is used to enlarge the skin opening. Or the knife tip can be protruded and the skin cut vertically or transversely over the cricothyroid space. The three dilator blades are inserted and spread to dilate the vent. Further puncture, cutting and dilatation of the membrane completes the emergency airway with comparative ease and speed; the dilating blades also produce a helpful hemostasis.

Unfortunately, although the instrument is excellent in principle, it is also a surgeon's design. For the nonsurgeon the handles are far too long; the finger pressure tab is unhandily spotted; three blades seem one too many; and the tiny dagger makes a clumsy knife (fig. 8). In its present design it is an instrument for surgeons, safe, fast and efficient for their use.

Used beyond its design and purpose, we have successfully employed it for tracheotomy. The tiny dagger was scarcely meant for producing the wider exposures which are necessary. Nor is the present instrument suitable for prolonged holding open of a tracheal stoma.

(b) *Stonecypher*[15] has pointed out that a Trousseau dilator might be sharpened at its tip and thereby become an effective and rapid cricothyroid puncture tool. Modifications of this original idea (figs. 7 and 8) have included shortening

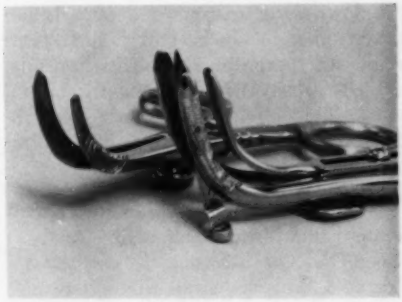

FIG. 8—A close-up view showing the blades of the Salvatore-Maloney (front) and Stonecypher (rear) dagger-dilators.

of the dilator handles for comfortable handling by nonsurgeons, provision of serrated gripping surfaces at the bases of the blades, a lock ring about the handles to hold open the stoma, sharpening of one blade only, with shortening and blunting of the other, and standardization of blade width at 5 mm. In order to ascertain the dimensions of permissible blade width and length, and actual hazards to the cricoid cartilage, cadavers of an 8-hour-old baby and an adult were dissected and studied. Five millimeters is the internal diameter of the airway at the cricoid in the newborn, hence this was chosen to be the minimal width of the blade.

In the hands of nervous and tense nonsurgeons, these modified blades tended to spread slightly during stabbing. The blunt blade then prevents the dagger blade from full penetration. Crossing

the handles to the scissors-hemostat position solved this problem. Furthermore, there was a marked tendency to approach the neck for a vertical stab rather than a transverse one. This natural "feel" of the instrument which creates the hazard of chopping into the cricoid or thyroid cartilages must be forestalled by training. With transverse entry, the lower blade in the tracheal lumen blocks the downward passage of a cannula between them. Once entry has been achieved, therefore, the blades must be turned 90° so that they hug the lateral walls. This obvious maneuver may require training, but has been done spontaneously by some operators.

The modified Stonecypher instrument showed highly favorable characteristics: speed, ease of handling, hemostatic effect of the blades while dilating an adequate stoma, little damage to the cricothyroid muscles, small tendency to harm the cricoid back wall and high relative confidence evinced by nonsurgeons. An untrained sophomore medical student without clinical experience of any kind successfully performed the cricothyrotomy in 25 seconds from the time of approach to the dog, with 15 seconds additional for passage of a cannula. Another untrained test subject erred in his identification of the entry point but created a very adequate stoma through the cricotracheal space.

A nasal speculum designed by Proud was sharpened at the tips to appraise its dagger-dilator potential. Efficient as it seemed to be for cricothyrotomy, the instrument was clumsier and more complex than the Stonecypher instrument.

The sharp dagger blade is an efficient cutting tool. Therefore, cutting vertically through the skin and between the strap muscles, retracting with the blades and fingers, the instrument can be used successfully for a tracheotomy. Bleeding, low visibility and the deep-lying position of the trachea are obstacles to the nonsurgeon. Skin retractors and a hook can vastly improve the procedure for him (see below). An untrained medical student made successful tracheal entry in 3.5 minutes and cannulated in 35 more seconds.

7. *Scissors (Cutting-Stabbing-Dilators).* The effectiveness of the dagger-dilator principle as embodied in the Salvatore-Maloney and Stonecypher instruments suggested that simple pointed scissors would meet some of the objections to instruments designed for surgeons. Every doctor and technician feels comfortable with the familiar scissors (fig. 9), knowing that they are capable of

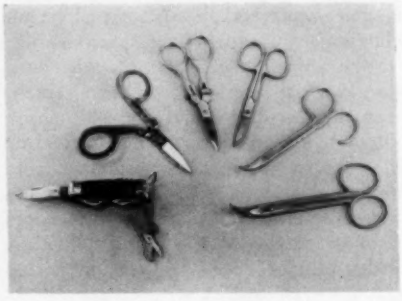

FIG. 9—Scissors.

cutting, stabbing, spreading-dissecting and dilating functions. Any pointed scissors will function readily as a cricothyrotomy instrument. Pinching up the skin and snipping through it removes the tough loose skin as an obstacle. Thereafter any pointed scissors can be pushed easily through fascia and membrane below.

Curving the blades encouraged wrist pressure for stabbing through the membrane. Sharpening of the vertical edges for 2 mm. dorsally and ventrally con-

verted the scissors into an efficient dagger. Vertical widening of each blade to 5 mm. allowed the blades to hold an adequate stoma when they were spread apart. A cannula easily passed down and between the curved blades, following the trough thus formed. The broad curved blades produced scissors which appropriately looked like the legendary Kansas jayhawk, or like the living toucan. Nonsurgeons handle the jayhawk scissors with confidence, although our first models are somewhat clumsy in look and feeling (fig. 10). In early tests two untrained sophomore students performed cricothyrotomy with elapsed times of 30 and 45 seconds.

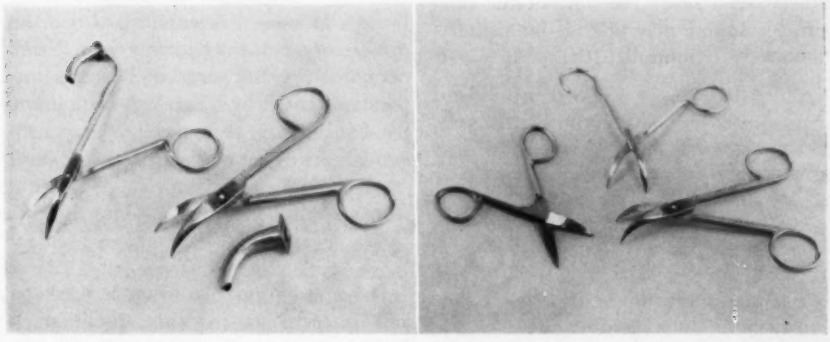

FIG. 10—Scissors, including jayhawk design.

If a low tracheotomy is attempted, the four functions of the scissors again can be exploited successfully and speedily. And there is little danger of damage to the esophagus.

With the development of an efficient bivalve cannula capable of easy passage along a narrow fissure, the importance of the jayhawk wide-blade modification has been minimized. Any dagger-pointed and preferably curved surgical scissors will function well with this cannula, as we have shown.

Scissors can be modified readily for pocket instruments. They can be incorporated into knife handles, as in the multi-bladed knives produced in Switzerland, Germany and Japan. Handles can be folded to reduce their size to fit into small cases. Such adaptations will be of significance if they encourage all practitioners to carry a multipurpose pocket or key-ring scissors which actually can function well for the creation of an emergency airway.

There appear to be enough advantages accruing to scissors to suggest that the nonsurgeon's thinking in anticipation of future emergency entry into the airway should focus on the availability of scissors rather than upon knives.

8. *Miscellaneous Tracheotomy Accessories.* In the experiments with low tracheotomies, three accessories seemed useful for facilitating the procedure, whatever the instrument: a procaine syrette, a skin retractor, a tenaculum. A suction bulb with soft rubber catheter for removal of secretions and/or blood is a fourth accessory which may be of cardinal importance on occasion. A small kit containing instruments and accessories for the doctor's bag, the first aid box or the emergency tray may have

some utility, notably for mass disasters or for warfare.

(a) *Ampules of local anesthetic.* Pain is usually a factor. Syrettes containing 0.5 cc. of 1 per cent procaine hydrochloride (Abbott Laboratories) have been manufactured for use in blood banks. Although procaine is perishable, such syrettes were facile and potentially useful. Infiltration of the cricothyroid skin area, membrane and laryngeal mucosa is quick and easy if time permits. Otherwise, a sharp pinching of the skin before snipping may provide momentary numbness to minimize the pain of so speedy a procedure.

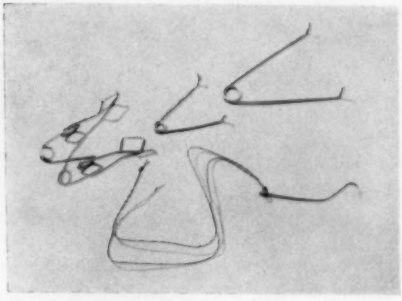

FIG. 11—Skin retractors.

(b) *Skin retractors* were made from safety pins, paper clips, bobby pins, wire of several kinds, all the materials of tracheotomy legendry. Ultimately, a simple self-retaining fingertip skin retractor was fashioned of stainless steel spring wire. Its design, performance and simplicity appear to answer the requirements for skin and muscle retraction. The value of the retractors for other surgical procedures has been commented upon by our colleagues in plastic surgery.

(c) *A tenaculum* has long been a part of tracheotomy procedure, not only to fix the trachea, but also to improve visibility for the crucial final steps of entry into the trachea and passage of a cannula. A modification of the skin hook devised by Leveridge[9] provided an efficient tracheal gaff. Pulling the trachea upward into the incision aided greatly in visualizing more fully the section of the tracheal rings and the insertion of a cannula. Double hooks were well handled by the surgically apt; the single hook was easier for nonsurgeons. Although Jackson[7] has emphasized that the dire emergency tracheotomy is a "feel" operation for the surgeon, it seems imperative that it be a "see" operation for the nonsurgeon. A tenaculum may help to realize this requirement for visibility.

E. *Testing* of Dagger-Scissors, Dagger-Dilator and Bivalve Cannula*

It seemed proper to test our methods and instruments in some preliminary fashion. It was our assumption that the medical student, nurse or aide would receive some minimal instruction and practice in emergency airway management even if he could not be exposed to real experience in the human for this initial training. Therefore, in lieu of a specific training film, the film report of this study was shown once to a group of sophomore and junior medical students and followed by a brief discussion period. Thereafter a pantomime run-through in standing position was performed by each subject upon his partner, each handling both instruments for his mock operations. The junior students had had recent laboratory experience in

*Earlier similar but unsystematic tests were conducted with 6 students using the jayhawk scissors and an earlier version of the dagger-dilator, before the bivalve cannula development.

physiology and pharmacology utilizing dog subjects but had not yet had clinical experience. No intimation was given that an early performance test would be forthcoming.

Nine to eleven weeks later, nine students and one untrained control were called independently and without warning from their classes to perform cricothyrotomies upon airway-obstructed dogs.* Five students utilized the dagger scissors with the bivalve cannula. Five used the modified Stonecypher dagger-dilator with the bivalve cannula. Of six given a choice of both instruments, five chose the scissors. Although speed seemed to be the sum of personal courage plus an intrinsic feeling for manual action, only one person (a laboratory-trained woman student) exceeded four minutes (4 minutes, 25 seconds), most of which time was expended in her slowly gathering confidence to proceed. Seven of the ten test subjects, including the control, a future surgeon, achieved a stoma in 60 seconds or less. It seems plain that the use of a methodical training film confined to the recommended methods only, plus systematic preliminary mock practice on humans or dogs, would have reduced the average time to a very few seconds.

DISCUSSION

Nelson[10] has neatly divided airway obstructions into two groups: mechanical respiratory and secretional ventilatory obstruction. In general, these two groups can be categorized also as upper and lower airway obstruction. With the development of anesthesiology as a science and with the wider range of modern surgery, indications for surgical tracheotomy have greatly increased. At the same time, disaster and military medical training have shown the need for improved approaches to emergency airway production for the nonsurgeon. The large number of recent articles on tracheotomy confirms our thesis that it is timely to re-examine principles, methods and instruments.

The prime assumptions of this study were (1) that those trained in surgery can usually produce an emergency airway in a situation of demand, and (2) that nonsurgeons facing a dire emergency usually cannot and will not attempt tracheotomies with their present lack of training and available tools. Therefore our interest was focused upon the nonsurgeon and his actions at the time of his *first* dire emergency. Anything which might accrue to the surgeon's benefit would be considered a bonus. We must emphasize that we constantly sought to maintain the point of view of the nonsurgeon, a difficult thing during the increasing familiarity of the procedure to all concerned.

Criteria of success for procedures included speed, safety, adequate stoma and such simplicity of approach that the operator would have self-confidence. Obviously, the simpler target for the nonsurgeon was the well-exposed cricothyroid space, for tracheotomy in the human can be difficult indeed. Cricothyrotomy methods were given first priority and tracheotomy second place, although it was hoped that chosen instruments could be applied to both. Notwithstanding forbidding reports of postcricothyrotomy stenoses[16] dating principally to the pre-antibiotic era, and notwithstanding Nelson's valuable, if limited, data[11] on experimental damage to the cricoid cartilage of the dog, it was our

*The prominent cricoid cartilage of the dog was usually mistaken for the Adam's apple unless the student was verbally alerted in this regard. One student did cricotracheal puncture.

conclusion that in American civilian practice in peacetime, the life-saving cricothyrotomy could in almost every case be followed within 48 hours by low tracheotomy performed by a surgeon in a hospital operating room. In time of mass disaster or military crisis, either the tracheotomy could sooner or later be performed or the patient would die of other causes, whether or not he had been subjected to an emergency cricothyrotomy. Or the patient could better risk many days of a cricothyroid stoma than die early because a medical first-aid man was fearful of tracheotomy. Or an overworked doctor might consider the patient with an obstructed airway too poor a risk for the time and equipment of tracheotomy, yet he would not hesitate to do the easy cricothyrotomy. Critical contemporary studies of the true hazards of cricothyroid puncture and cannula retention should be undertaken in light of the reactivity of the lower larynx contrasted with the lack of reactivity of the trachea, and the need for a post-tracheotomy normal larynx. All of the experiments reported here were of short-term duration and could not define such hazards. All efforts were bent toward methods which would produce minimal trauma to the structures surrounding the cricothyroid space, notably toward a transverse approach which minimizes the risk of cricoid section.

For comparative laboratory experiments involving the larynx and trachea, the dog appears to be an anatomically appropriate subject. In the dog the cricothyroid area is rather similar to that of the human, while the tracheal region resembles that of the human somewhat less. When and if medical professionals are trained methodically in emergency airway techniques, survivor dogs should be adequate for demonstrations and realistic preliminary student experience. Our experiments involved 55 dogs, 9 patients and 4 fresh cadavers required during the evolution of the project.

Based upon film and on-the-spot analyses of cricothyrotomies, knives and trocars with cannulas were deemed to be fundamentally less satisfactory than dagger-dilators and scissors. For the trachea, the Shelden tracheotome[14] may compare favorably with the scissors and dagger-dilators, although its greater complexity and the blind maneuvers entailed in its use are undesirable. The relatively blind puncture of the dagger-dilators may be no obstacle to surgeons who like their efficiency of approach. But nonsurgeons appear to feel more comfortable and probably operate with less risk to the patient when they utilize scissors, since the first step in cutting the skin brings them immediately and palpably over the target cricothyroid space. Vertical thickening of the scissors blades in the jayhawk design appears to answer the need for an adequate temporary stoma with or without a cannula. However, any pointed scissors used with the new bivalve cannula appear to be adequate for entry. Scissors also lend themselves to cautious dissectional approaches, which nevertheless can proceed fast enough to save life.

Utilizing the instruments which appeared best for cricothyrotomy in their possible roles for tracheotomy, both the dagger-dilator and the scissors appeared to perform efficiently with the accessories described above. The bivalve cannula again performed admirably in combination with both instruments. Confident operators brought a high order of safety to the patients, even though the dagger-dilator obviously was not made to function for tracheotomy, and the scissors were relatively slow (fig. 12).

The bivalve spring cannula appears to be a useful old-new development to aid entry through small fissures. Its taper

makes it nearly "universal," even for the wide range of patient tracheal diameters. We did not feel that it was necessary to produce an ovoid cross-section specifically for the cricothyroid space, although this would be easy to do. The new obturatorless angle-tipped short cannula

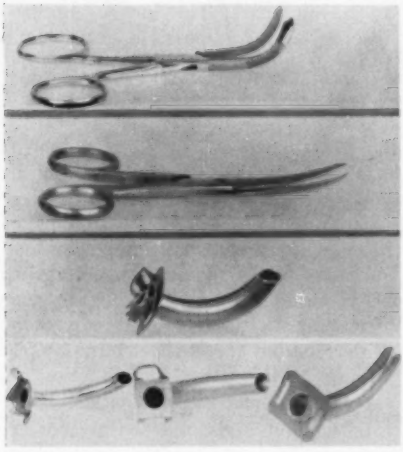

FIG. 12—Cricothyrotomy instrument complex. Top to bottom: (1) dagger-dilator, derived from original Stonecypher modification of Trousseau dilator; (2) curved dagger-pointed surgical scissors with short handles; (3) and (4) nest of cannulas, including exterior tapered bivalve cannula with angled tip, sprung to remain open, and no. 3 and no. 7 inner angle-tipped cannulas.

functions well by itself, or when used with the bivalve functions as an inner solid cannula. A tenaculum, self-retaining skin retractor and suction tube with bulb would appear to be useful auxiliaries for tracheotomies.

In order to report the essentials of the comparative evaluation and the evolution of particular instruments and approaches in more concrete fashion, a film entitled "Emergency Airway"[12] has been edited and narrated. The footage consists largely of performances filmed for observation. It should be considered as a functional segment of this written report, and demonstrates much that cannot be described readily. See also the U. S. Navy film entitled "Cricothyroidotomy"[18] (1953) for comparison in methods.

RECOMMENDED METHODS OF EMERGENCY CRICOTHYROTOMY

Although the dog and human have significant anatomic differences, it seems possible from our over-all experience to project procedures which are applicable to human emergencies. For nonsurgeons in the dire emergency of airway obstruction, these alternate methods are recommended. We make no reference to the trying circumstances surrounding the dire emergency which so greatly modify the pure technique of the tracheal entry.

1. *Utilizing the Modified Stonecypher Dagger-Dilator with Bivalve Cannula*

A. Place a pillow under the scapulas of the supine patient to elevate the shoulders. Fix the neck in moderate hyperextension, if possible, with chin and sternal notch in the median plane.

B. Identify the cricothyroid space by palpation. If 1 per cent procaine hydrochloride is available, infiltrate the skin and deeper tissues but do not confound the clear identification of the target area.

C. Grasp and fix the thyroid and cricoid cartilages between the thumb and middle finger of one hand, the forefinger tip firmly in the cricothyroid space. Place the dagger tip of the instrument transversely over the center of the cricothyroid space, carefully guiding placement of its point down the nail of the palpating forefinger onto the skin. The point must be exactly in the midline over the center of the cricothyroid membrane.

D. Press the blade firmly and strongly through the skin and membrane in one thrust, using wrist pressure only. Or cut the skin transversely 1.5 cm. and palpate through the cut before pressing through. Dilate the stoma by spreading the blades forcefully. If the stoma seems too small, as it may in some adults, extend both ends of the skin incision with the cutting edge after respiratory relief has been achieved. Hold the instrument in place manually, preventing expulsion by coughing.

E. With the bivalve cannula available, remove inner solid cannula, compress the tips of the bivalve outer cannula, slip the blades past the dagger-dilator blades and remove the dagger-dilator. Pass the bivalve into the airway as far as it will go and release pressure. Insert the inner cannula as far as it will go, so that the stoma will dilate maximally, and fasten the cannula to the neck as required.

2. *Dagger Scissors with Bivalve Cannula*

A. Place the supine patient in the required median plane with neck hyperextension of moderate degree, chin upward.

B. Identify the cricothyroid space with the finger tip, and infiltrate the skin with local anesthetic, if available.

C. With thumb and forefinger pick up a vertical fold of skin over the membrane and snip through the skin to produce a short transverse cut of perhaps 1.5 cm. Do *not* dissect.

D. Identify the visible blood vessels and avoid them. Grasp and fix the thyroid and cricoid cartilages between thumb and middle finger, while with the forefinger again identify the cricothyroid membrane *through* the incision. Guide the point of the scissors down the fingernail into the center of the membrane. Press through with wrist pressure and spread the blades. Dilate as required.

E. For insertion of the cannula, the inner tube is removed, the bivalve blades are pressed together and are thrust past the scissors blades. The scissors are withdrawn, the bivalve inserted as far as it will go into the airway and allowed to spring apart. The inner cannula is inserted as far as possible, and fastened to the neck as required.

SUMMARY

The production of an emergency airway is simple in principle, and relatively so in practice. Simplified methods and instruments are recommended for nonsurgeons who may, in dire emergency, be required to produce an emergency airway. It is assumed that cricothyrotomy is permissible for a short-term by-pass airway in this age of antibiotics and rapid transportation to hospitals. Therefore, methods recommended are for cricothyrotomy, although the same instruments are reasonably effective for tracheotomy as well. Comparison of many instruments and methods now available suggests that dagger-dilators are most effective. Of these, a modification of the Stonecypher dagger-dilator and a curved pointed scissors meet the technical criteria for simplicity, speed of entry, safety, and adequate stoma, and the psychological criterion of self-confidence for the operator. With a new "universal" bivalved double cannula, it is easy to enter the airway past the instruments and to maintain good passage. The dagger-dilator perhaps has a slight advantage for the emergency room as a surgeon's instrument. For nonsurgeons, the dagger-scissors have the great advantages of familiarity, high efficiency, and multiple utility.

ADDENDUM

Since October 1959 further opportunities have arisen to expand the scope of the study, to test new instruments or accessories made available by other workers, and to achieve necessary technical improvements in the design of the dagger-dilator, dagger-scissors and bivalve cannula. Seven additional dogs, a mohair goat, four cadavers, and three patients have added to the stock of experience and the practical trials of instruments in our various hands. Finally, a training film entitled Emergency Airway, Part II: Crisis and Action[11b] is in the final stages of production and will be released in June 1960. It incorporates the lessons of the study in terms of medical student and practitioner learning.

1. Nicholas and Rumer[11a] of the Army Medical School at Brooke Army Medical Center, Fort Sam Houston, have concurred in our emphasis upon cricothyrotomy as the approach for nonsurgeons, and they are utilizing the suggested instruments in their military medical training efforts.

2. Large-diameter hollow needles specially designed for emergency airway relief in babies have been devised by Goff[3b] and Galloway.[3a] These two needles were tested on eight-pound puppies. Our general impression of the obstacles to effective use of needles *(vide supra)* was confirmed, despite the ingenuity of the designs and the apparent logic of the large-bore needle as a temporary life-saving solution to respiratory tract obstruction.

3. Anatomic dissections of fresh cadavers underlined the necessity for transverse approach to the cricothyroid space, and emphasized that the blade curvature of both dagger-dilator and dagger-scissors tends to prevent trauma to the posterior wall and to foster the requisite wrist action for puncture.

4. Further experience with the dagger-dilator suggests that it is desirable to perform immediate transverse cutting of the skin over the cricothyroid space, followed by puncture and dilatation. A 1-cm. skin cut allows for a much more adequate stoma without the excessive and doubtless painful skin stretching otherwise required.

Acknowledgements

The staffs of the Departments of Otorhinolaryngology and Surgery have been extremely helpful with suggestions and with performances of tracheotomies. Drs. Russell Bridwell, Roger Wehrs, Harry Draemel, Fernando Kirchner, Kenneth Hedrick and others have assisted in the experiments. Dr. Leo L. Leveridge, formerly of Pfizer Laboratories, has been a constant source of suggestions, criticisms and devices to improve methods and instruments and has collaborated on the film production.

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DISCUSSION

THOMAS C. GALLOWAY, M.D., Chicago: At a recent conference on national defense, Colonel Joseph D. Goldstein (J.A.M.A., 171:195-197 [Sept. 12] 1959) opposed the idea that tracheotomy is the preferred method of treating respiratory obstruction in the absence of trained physicians. Colonel E. H. Vogel (ibid., 205-208), at the same conference, said, "It is of course impractical (in disaster situation) because of the lack of trained personnel and necessary equipment to do tracheotomy."

On the other hand, Ziperman and Thornton[17] of the Army reported that 864 first tracheotomies done by physicians and 271 done by auxiliary personnel, using the Sierra-Shelden tracheotome, were successful in spite of posterior perforation in 2.92 per cent of the cases.

There is little doubt that, whenever possible, tracheotomy should be done deliberately by a physician well trained in laryngology and endoscopy. But surely in the devastating injuries that would follow a nuclear attack from secondary missiles, falling walls, burns and other causes, many precious lives could be saved by such techniques as we have seen today, with relatively simple equipment that can be stockpiled in advance. Such methods would not only multiply manyfold the effectiveness of medical men, but could be used by dentists, medical students, corpsmen and nurses. At some time this Academy should probably take a stand on this subject.

As stated by Leo Hoegh, "Civil defense, to be effective, will involve every human being, professional and nonprofessional, and every facility that can be found."

This exposition is a brilliant start, but probably considerable further improvement can be made. It must be established that the late results of cricothyroidectomy by this technique are good in a high percentage of cases. My own experience with the Denker instrument thirty years ago was that it involved considerable trauma, with injury to the cricoid and the conus elasticus, and perichondritis, frequently laryngeal stenosis and vocal disability. Anson and Mattock (Surgical Anatomy) state that this approach, except in children, opens sufficient interval to admit a tube but should be abandoned because it predisposes to laryngeal stenosis. Hollingshead (Anatomy for Surgeons, vol. 1, p. 443) says also that it has largely been abandoned because it approaches so close to the vocal cords that it predisposes to laryngeal stenosis.

I should prefer to see the authors' technique adapted to high tracheotomy. This provides good fixation and superficial access. In a considerable experience with tracheotomies done as high as the first interspace in respirator patients, I have seen little late trouble.

Trocars for initial entrance are not usually well enough made to prevent the cannula edge from hanging. That was the fault of my own instrument previously presented here. This fault is now avoided by the Canning needle, made of stainless steel, with a sharp hollow-ground edge. After nicking through the skin, this needle easily penetrates either interspace or cartilage with little more force necessary than to register penetration to the operator. This prevents flattening of the trachea, which is especially important in the soft tracheas of women and children. The curve and bevel protect the posterior wall.

After entrance, a bistoury-type scalpel easily follows the groove and is advanced with the needle to make either a vertical or V incision. A guided Jackson tube can easily be advanced in the same way. The expanding cannula shown by the authors should be valuable for this step. Unfortunately, I have not had this needle long enough to use it except on the cadaver, but I believe that it should prove valuable.

THE AVAILABILITY OF FUNDS FOR RESEARCH IN OTOLARYNGOLOGY

JUERGEN TONNDORF, M.D.
IOWA CITY, IOWA
BY INVITATION

THIS paper is written upon request of the *Committee on Conservation of Hearing* of the American Academy of Ophthalmology and Otolaryngology, for the information of those in the broad field of Otolaryngology interested in obtaining support for research study.

The broad field of Otolaryngology includes the ear, nose, throat, nasopharynx, oral cavity, larynx, esophagus, tracheobronchial tree, and neck. Proposed studies may include symptomatology, etiology, diagnosis, course, complications, and therapy of otolaryngic disorders. The work may involve clinical studies on human patients, or may present laboratory experimentation. Studies may follow investigative methods in such fields as anatomy, embryology, histology, biochemistry, sensory psychology, biophysics, audiology, experimental surgery, pathology, and microbiology.

Rarely are individuals who are interested in medical research able to finance their studies from private funds, i.e., without outside support. In addition to the declining buying power of the dollar and increasing taxation, there are several factors responsible for this trend:

1. The increasing complexity of the necessary equipment and facilities.

2. The rapid development of new, improved instruments, making older equipment obsolete at a rapid rate.

3. The need for specialized technical help, necessitating the training and employment of auxiliary personnel and/or enlisting the aid of whole technical services.

In short, present-day research has reached a stage at which individuals (even individual institutions) can no longer be expected to support research out of their own pockets. There are exceptions to this rule, but they are few.

The present discussion will be confined to the description of *federal* support for medical research, because it follows well-established policies developed over the past twenty years, and at least at present carries the major burden of support. Medical research has been supported by *philanthropic* organizations and by *commercial* enterprises (mainly drug companies) for some time, but this support was never on an organized large scale, laudable as those efforts were. However, interested individuals may well look into the possibility of obtaining support from local or national organizations, philanthropic as well as commercial. Recently, some of these have begun to follow the general policies established by federal agencies.

Since many of these organizations are regional, or at least administer their funds through regional channels, no attempt has been made to list them. Such a list would probably be incomplete, and, therefore, of questionable value. At most medical schools, a file of such organizations is maintained in the dean's office.

From the Department of Otolaryngology and Maxillofacial Surgery, State University of Iowa, Iowa City, Iowa.

The beginning of organized, large-scale support of medical research in the United States dates back to World War II, when the Defense Department recognized the need for such support. The emphasis at that time was, of course, on *military* problems, such as Aviation Medicine, to which Otolaryngology has made notable contributions. In addition to studies carried out at their own institutions, the two branches of the Armed Forces (the Air Force was not established as an independent branch until after the war) supported research at universities and equivalent institutions on a contractual basis. (The significance of the term *contract* will be discussed later.) These programs were correlated by the Office of Scientific Research and Development.

After the war, when the interest in purely military research suffered a natural lapse, the existing channels of communication and support were not abandoned, but were put to large-scale use in the support of research with less definite or even nonmilitary objectives. Therefore, during the years 1945 to approximately 1955 most major research in the field of Otolaryngology was supported by contracts with military agencies. During this time, the footnote with the familiar: "This research was supported by contract with . . ." became almost a trademark for a large number of scientific medical papers.

Wartime efforts to apply research findings and extend technology at an accelerated pace had clearly demonstrated the need for underwriting basic research on a continuing basis. The first organization developed for this purpose and destined to set a pattern for the military services was the Office of Naval Research (ONR), operating under a contract procedure.

During the postwar period, other government agencies came into being, reflecting the rapid acceptance of national responsibilities toward scientific developments. Some of these agencies were charged with supporting basic research falling under cognizance of its divisional structure, while others became institutes with interest in supporting research related to disease entities or biological systems. The former is represented by the National Science Foundation (NSF) and the latter by the Public Health Services (PHS). PHS was established in 1946 within the framework of the Department of Health, Education, and Welfare.

Within the PHS, the program to provide support of nonfederal medical research projects is administered by the National Institutes of Health (NIH), centered in the Division of Research Grants. Research grant applications are reviewed for scientific merit through thirty-five study sections, each of which is concerned with an individual specialty field. All applications receive a double review — first by the appropriate study section, and second by councils to be described later. Applications for Otolaryngologic research grants usually come under the administration of the National Institute for Neurological Diseases and Blindness (NINDB), following an initial review by one of the study sections of the Division of Research Grants.

The extent to which emphasis has been shifted toward NIH, and also the extent to which support by PHS has grown, may be seen from graphs (figs. 1 and 2).*

Figure 1 shows two facts: (1) the total federal budget for all agencies concerned with research support has more than doubled within the four years from

*Data relating to the National Institute of Health, September 1958.

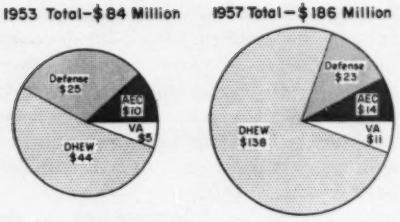

FIG. 1—Support of medical research by federal agencies for the years 1953 and 1957.

1953 to 1957, and (2) the share of the Department of Health, Education, and Welfare (DHEW) increased from about 50 per cent to about 75 per cent of the total. Figure 2 shows that the rate of growth of the PHS budget for research and training increased every year since its inception, moderately at first, but taking a sharp upturn in 1956.

Of late, another office of the DHEW, the Office of Vocational Rehabilitation, has taken an active interest in the support of research in the broad field of Otolaryngology. Numerous institutions have received grants for research concerning aspects of speech and hearing handicaps, which definitely come under the designation of "vocational rehabilitation."

The armed services have not altogether discontinued support to medical research, but they have confined their efforts once more mainly to problems of purely military interest. This does not mean they have dropped all current support of nonmilitary problems, but rather that, as a rule, they do not take on new projects which have no military bearing. Especially in medicine, there has always been a certain overlapping of military and nonmilitary problems, so the line of separation cannot be drawn too rigorously.

Understanding of the basic differences between the original military research "contract" and the PHS research "grant" is important. The contract type of research was based upon standard government business policies with regard to the manufacture and supply of materials of any type. Under such an agreement, the "contractor" agrees to develop, build and deliver a certain piece of equipment, and is paid an agreed price for services rendered. Subletting of certain phases of the work must be specified. Auxiliary equipment he may need in the fulfillment of his contract remains the property of the contracting agent, and is usually returned to the latter at the termination of the contract.

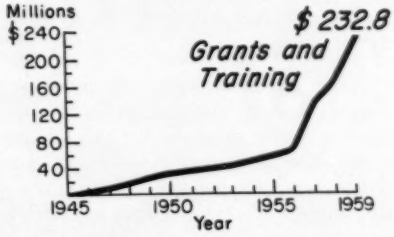

FIG. 2—Growth of funds available to PHS for grants and training.

Contracts are made for specified periods of time, usually one year, although they may be renewed if this is in the mutual interest of both parties. By and large, identical procedures are used for the administration of research contracts. That one-year projects are not well suited to support of original research has long been recognized by all concerned, but it is the standard procedure specified by law.

In justice to the personnel of various military agencies who have been, or still are, administering research contracts, it must be said that most of them showed wisdom in applying the pertinent rules and regulations in a sensible manner. These men recognized that too literal interpretation of the law would stifle orig-

inal research, and they made every effort to avoid such situations. The amount and quality of the research supported by military agencies from 1946 to the present time make a record which speaks for itself.

For instance, the rule that the equipment bought under the contract be returned to the supporting agency was modified in the following way: When a contractor is no longer asking for funds on a contract, he can retain the equipment on an equipment loan so long as he is doing research requiring that equipment and is willing to provide periodic reports on what he is doing. The alternative is that he may bid for it if he anticipates further use of the item. In this way, the contractor is usually able to obtain the equipment at a small fraction of its actual value.

The PHS, as well as NSF, gives "grants" which are more flexible. This does not mean that PHS would accept proposals of lesser scientific merit than did the military agencies. However, the term "grant" or "grant-in-aid" takes cognizance of uncertainties which are basic to original research. That is, even well-planned research proposals can "fizzle"—result in insignificant conclusions. Also, progress does not always follow the outline of the original proposal, but may produce quite unexpected results, quite remote from the answer originally sought. In many cases, a project proposal is part of a continuous effort on the part of the investigator, so that support is worthwhile only when plans can be made on a long-range basis. The equipment bought under PHS grants becomes immediately the property of the grant-receiving institution (not of the individual researcher!). The policies of the military agencies with regard to equipment were outlined above. In all fairness it must be added that the policies of the military agencies with regard to the support of research have changed a great deal since their program was initiated. For example, military agencies have recently received permission to give grants in lieu of contracts. Therefore, it is felt that the difference in the type of support offered by PHS and by NSF on the one hand and by the military agencies on the other will become less as time goes on.

In two other points there is no difference between contracts and grants. Although the technical details are worked out between an individual researcher—or the director of a team—and the supporting agency, the contract, or grant, is given to his institution, which then takes over administrative responsibilities with regard to budgets, inventories, etc. For this intermediary service, the institution is permitted to charge the supporting agency an amount of money for *overhead*. This sum is fixed by a general agreement. For example, in the case of the PHS, this amounts to an additional 15 per cent of the total direct costs.

The second point concerns the *facilities* in which the proposed research study is to be conducted. In general, neither contracts nor research grants will pay for construction of buildings, or for major structural alterations. The reason for this can be understood when one recalls the historic development of federal research support. The statement that they had the personnel as well as the facilities for conducting a proposed research study first opened the door to support by the Armed Forces for the universities. In all earlier contracts, this condition was an integral part of the basic agreement. Later, the Armed Forces softened their stand so far as personnel was concerned. Permission to hire and pay from contract funds technical personnel working under the supervision of the program director usually was granted. However, the original rule was never reversed with regard to the facilities.

Not until July 1956 did the PHS establish a special Health Research Facilities Branch for constructing, expanding and equipping research facilities. Upon application, money may be awarded, again to the institution, on a matching-fund basis; i.e., the institution must match every dollar given by the PHS.

At this point, two other types of support offered by the PHS, of potential interest to otolaryngologists may be mentioned briefly: (1) Individual Research Fellowship and/or Clinical Traineeships for persons seeking to widen the scope of their professional education after completion of their standard post-doctoral training. These grants are made to the individual, with the institution acting as the sponsoring agency. (2) Departments of Otolaryngology (as well as several other specialties) may be awarded "training grants" upon suitable application, to facilitate training of future academic personnel. The "training grant," administered by the institution, is made to the department, which within certain limits has considerable freedom in administering these funds. The budget must be itemized within the application; all items must contribute directly to training (not to research) and emphasis must be placed upon stipends for trainees.

Returning to the discussion of research grants, the methods of application will be described next. Figure 3, taken from the same PHS publication as figures 1 and 2, presents schematically the steps in achieving a research grant. The first step taken by a prospective applicant is to write to the Division of Research Grants (PHS). After receipt of the application, PHS will channel the proposal to the study section which appears to be best suited for the evaluation of the proposed research project.

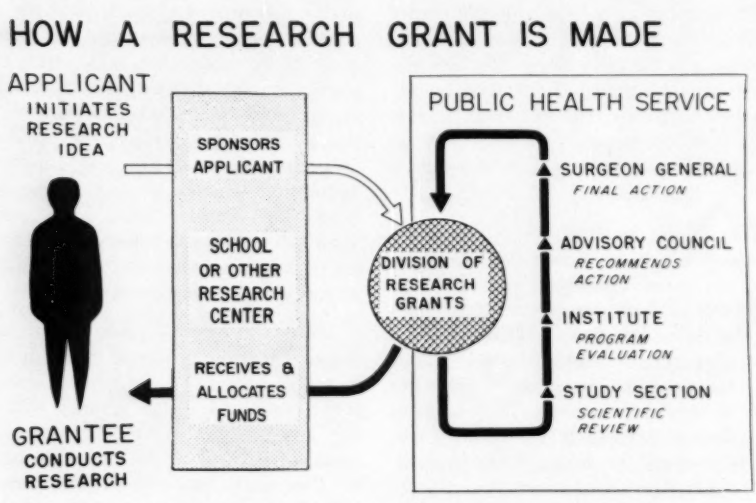

FIG. 3—Pathway of a grant from application to activation (PHS).

Since there are different forms of application for research projects, for training, for research facilities, and the

like, request should be made for the appropriate set of application blanks. With these application forms, one will find enclosed one of two brochures containing policy and general background information. Volume I of the "Grant and Award Information Statement" concerns grants for (a) research projects, (b) construction and equipping of health research facilities, (c) field investigation, and (d) special research projects grants. Volume II concerns (a) research fellowships and (b) training grants. Since these booklets contain all necessary information, most of it need not be repeated here. A few general remarks will suffice. (Much of the following is taken from the PHS Information Statement.)

As indicated by figure 3, the path each application travels is quite involved, and therefore takes time. In general, from the day the application is submitted until the time the grant is finally approved, six to eight months will have elapsed. Applications received between November 1 and March 1 will be reviewed by the various National Advisory Councils in June. Those received between March 1 and July 1 will be reviewed in October or November, and those received between July 1 and November 1 will be reviewed in February or March.

It must be emphasized that PHS research grants are not set up to provide support for predoctoral-thesis type of research or to supplement existing grants or contracts. Furthermore, the proposal must encompass a well-planned study above and beyond problems of exclusively local significance.

Application must not be made for the sole purpose of equipping a laboratory or obtaining a single large piece of equipment unless it is definitely related to the proposed research, and the application should not be made to cover mere clinical work with a minor research component. While clinical projects are sorely needed, they should follow a rigorous design.

After review by the appropriate study section, a second review is made by one of the National Advisory Councils for evaluation of the scientific merits of the proposed study. Each National Advisory Council is composed of a panel of nongovernment scientists and lay members who are noted for their own contributions in their fields. Their evaluation of the proposal is impartial, yet critical. If acceptable, "approval" of the application is voted and it is assigned a *priority* rank on an ideal scale based on its overall scientific merits, as the panel sees it. Whether the award is finally made depends upon this priority ranking and upon the funds available during the particular period of the government's fiscal year. During recent years, the PHS has been generously endowed by Congress, so that in increasing numbers, meritorious research projects are more likely to be financed than in the past. Therefore, an applicant should consider the double review by the Study Section and by the National Advisory Council the biggest hurdle toward receipt of a research grant, and accordingly should prepare his application with great care.

PHS grants are budgeted for periods of one year, which usually do not coincide with the government fiscal year. The reason for this limitation is that PHS's own appropriations are given by Congress on an annual basis. However, often overlooked is the fact that the budget sheet of the application provides for budget operations for five successive years.

If a commitment is made in this form (and this is done, as a rule), support for the remaining four years is conditional upon congressional appropriations. In the past, these future commit ments always have been upheld.

Provisions are made for increases in grant budgets through supplements to active grants, if the investigation underway necessitates and warrants such increases. Such supplements are given only upon submission and approval of appropriate applications.

Everybody who is concerned with the support of research is aware of the fact that it is sometimes difficult to outline a proposal in a concrete manner so that it will be acceptable to the supporting agencies. A researcher may have a "hunch" which he feels is worth pursuing; he may wish to perform a "pilot study" before formulating a full-fledged proposal; or he may run across a "hot lead" which he wishes to follow immediately, without waiting for formal grant approval. Particularly, young and inexperienced researchers are apt to find themselves in one of these categories. To help on such occasions, PHS previously had a program which recently has been altered with regard to one of its main provisions. Limited support (a maximum of $2000.00) was available, approval of which was less formal and, therefore, required less time. However, at the time of this writing these limited-fund applications are handled in exactly the same way as the regular applications, which has eliminated their time-saving feature.

Consequently, under the existing policies of PHS (and that of other supporting agencies) it is somewhat difficult for a beginner to obtain grant or contract support. There is one exception to this rule: If such a proposal covers a partial aspect of the general research program carried out in the laboratory of a man well recognized in his field, approval may be given upon the endorsement of the proposal by the supervisor.

However, it cannot be denied that some scientific discoveries had obscure beginnings and at first did not meet with the approval of their contemporaries. It seems that many important contributions made by "outsiders" in the past would have a poor chance of acceptance if they were to be proposed in their initial form today.

With regard to such proposals, PHS has the following provision: A visit may be made to the project site by a representative of the study section. His evaluation of the project may help to clarify the situation. He may also counsel the applicant as to the need of additional key personnel, etc.

Lastly, the following comment may be in order.* In the last analysis the support of research is a matter of confidence in the ability and willingness of the applicant to carry out his proposed project. A national agency like PHS can assess its confidence rating only on the basis of written statements. If personal contacts are made, they are necessarily brief. Therefore, there are limits beyond which the risk for the supporting agency becomes simply too large. It appears, however, that the institution at which such a novice applicant is employed is a better judge of his untried abilities and furthermore has a legitimate interest in his future development. Possibly based upon such a philosophy, some institutions provide operating funds for small-scale pilot studies, or what amounts essentially to the same thing, for getting an unproved investigator started. Support is given once and for a period of one year only. The explicit condition is made that he should submit a formal application on a larger scale to PHS or to whatever agency might be suitable as soon as he obtains tangible results. These specific rules apply to the "Central Scientific

*This is the only point where the author wishes to express a personal opinion. He has refrained from doing so throughout the rest of the article in that he has tried to convey only factual information.

Research Fund" which has been operating for a number of years at the Medical School of the State University of Iowa, where this writer is situated. It appears to fulfill its stated purpose. This writer has been informed that similar funds are provided at a number of other institutions. At Iowa, this fund is provided with monies from the earnings of the clinical departments.

The following summarizing statements may be made with regard to the availability of funds for the support of research in Otolaryngology. At present, a sufficient number of avenues are open to those seeking support for worthwhile research study, major or minor in scope. In the medical field, the PHS carries the major share of such support. Such applications for otolaryngologists are most frequently reviewed by the NIH Study Section on Sensory Diseases. In the case of study proposals of a more basic nature — morphology, physiology, biochemistry, biophysics, and the like— one of the thirty-five study sections of the Division of Research Grants may conduct the review. This review will be followed by a second review made by the National Advisory Council of the Institute most appropriate to the subject being explored.

A series of private (philanthropic) as well as professional organizations, either on the local or national level, are committed to the support of studies in Otolaryngology and/or specified subfields. Military agencies which carried the bulk of the support immediately after the war now aid, primarily, studies with military objectives. Space Medicine is one of these. Any otolaryngologist interested in research support may secure additional information from the Sensory Disease Study Section of the Division of Research Grants (PHS National Institute of Health, Bethesda 14, Md. Att'n: Dr. Thomas E. O'Brien).

The author hopes to have conveyed in this discussion the flexibility of PHS research grants and the high standard maintained by PHS in the acceptance of research proposals.

Papers like the foregoing are essentially a collection of information received from various individuals and agencies. (The only exception to this rule was noted above.) In order to assure correctness in the final paper, the author has asked several individuals, especially those administering research grants or contracts, to go over the paper before submitting it for publication. Suggestions made by these people were made unofficially and do not necessarily express an official opinion of the agency concerned. It is a pleasure to acknowledge valuable contributions made by Drs. A. Adler (NIH), R. N. Kraus (USAF School of Aviation Medicine), T. E. O'Brien (NIH), and R. Trumbull (ONR).

INTRACAPSULAR FORCEPS

JOHN M. MCLEAN, M.D.
NEW YORK, NEW YORK

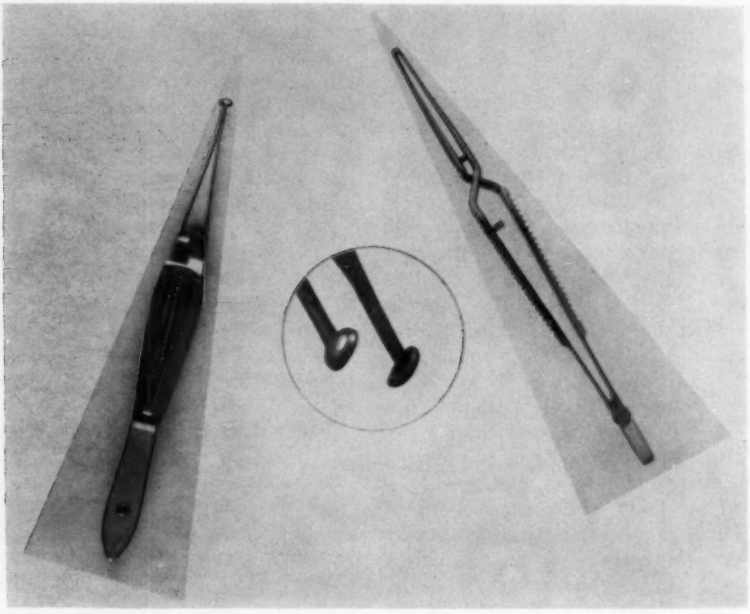

FIGURE 1.

IN order to utilize the features of several instruments and methods, a pair of intracapsular forceps has been constructed placing Arruga-type tips at right angles to a perfectly straight cross-action handle of the Castroviejo type in order to grasp the lens capsule at the equator above. The forceps may be introduced on the flat and applied to the lens through the coloboma if an iridectomy is done. If a round pupil is to be maintained, the lower blade of the forceps acts as a very convenient iris retractor as the forceps are being introduced. Ordinary intracapsular extraction may then be done by the Verhoeff or Kirby maneuvers with the hand relaxed, since the cross-action handle maintains satisfactory grip on the capsule. If alpha-chymotrypsin is used, the lens may be plucked out of the eye without any counterpressure, and without any risk of damage to the endothelial surface of the cornea through introduction of forceps or erisophake in that area.

From the Department of Surgery (Ophthalmology), New York Hospital-Cornell Medical Center.

Presented as a *New Instrument* at the Sixty-Fourth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 11-16, 1959, Chicago.

ANIMATED FIXATION TARGETS FOR STRABISMUS EXAMINATION

ARTHUR JAMPOLSKY, M.D.
SAN FRANCISCO, CALIFORNIA

FIGURE 1.

ATTENTION getting fixation targets are desirable for strabismus examination of children. Electrically controlled toys which display movement, sound and light facilitate the examination by freeing the examiner's hands, allowing frequent change of toy target through simple utilization of a photographer's foot pedal switch which consecutively changes the target by activating a micro-relay switch (fig. 1).

Presented as a *New Instrument* at the Sixty-Fourth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 11-16, 1959, Chicago.

Made by Parsons Optical Co., San Francisco.

AUTOMATIC RELEASE FOR ERISOPHAKE

WILLIAM STONE, JR., M.D.
BOSTON, MASSACHUSETTS

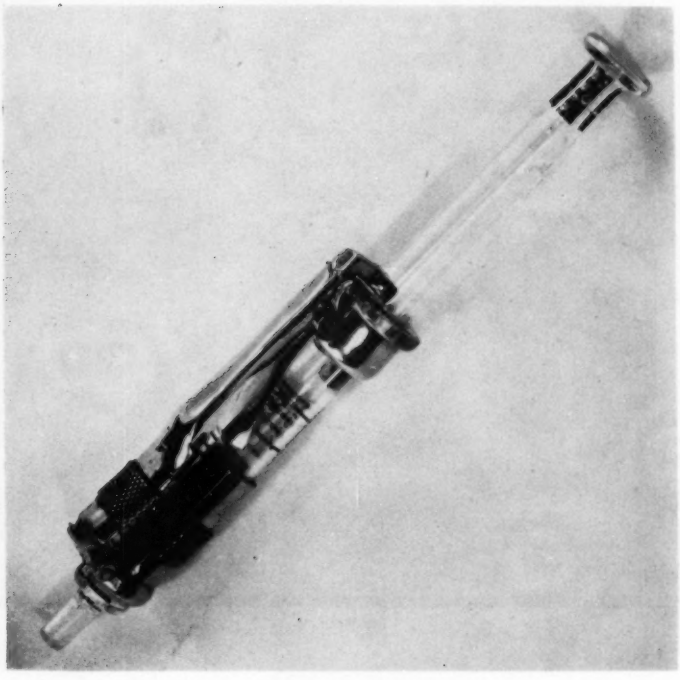

FIGURE 1.

THOSE of us who use the Dimitri or the Chandler-Grant syringe for application of the erisophake, know that it is somewhat clumsy to hold the barrel of the syringe in the fingers of one hand and the plunger with the fingers of the other hand, before release. The shift of hands may also be somewhat dangerous.

With a new device (fig. 1), the plunger can be released automatically with one hand and one finger control. Its release can be graduated and stopped at any point to accommodate fragile lenticular capsules.

Director, Ophthalmic Plastics Laboratory, Massachusetts Eye and Ear Infirmary.

Supported in part by O.W.R., contract 1173-01, and Massachusetts Lions Eye Research Fund, Inc.

Presented as a *New Instrument* at the Sixty-Fourth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 11-16, 1959, Chicago.

After application, the release lever locks in place, flush with its body, making it possible to rotate the barrel of the syringe between the fingers.

The device seems to increase the delicacy of application and the safety of the erisophake.

ELECTRIC SUCTION SHARP NEEDLE POLYP COAGULATOR

D. Harbert Anthony, M.D.
Daniel F. Fisher, M.D.
MEMPHIS, TENNESSEE

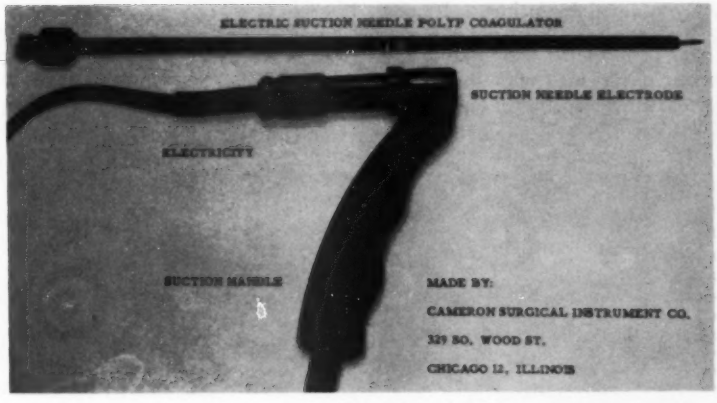

Figure 1.

During the past year, we have had tremendous success with the nasal polyp coagulator (fig. 1). It consists of a sharp electrode needle 10 mm. long, mounted in a handle of convenient size, with insulated suction. This coagulator measures 6 inches by ⅛ inch. It fits the Anthony-Fisher Universal Handle, which is also used in electrocoagulation suction for bleeding nasal vessels. The current source is the Cameron Radiocautery. Because it is monopolar, the patient must be grounded.

For small polyps, the electrode is inserted 7 mm. into the center for three seconds, and for medium-size polyps, three seconds to each side. A blanching of the polyp tissue indicates sufficient coagulation of the area. The control setting on the radiocautery ordinarily works better at 3 for the old radiocautery and at 6 for the new radiocautery. If

Presented as a *New Instrument* at the Sixty-Fourth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 11-16, 1959, Chicago.

smoke is produced, suction can be turned on to remove unpleasant odor.

The result is a coagulation of blood vessels and lymph channels in the polyps, and they usually shrink or disappear in two to four weeks. If necessary, it can be repeated in two weeks and as often thereafter as required. It can be used before and after polypectomy and is particularly valuable when there is a tendency to reformation of polyps after surgical removal.

The operation using this coagulator is a satisfactory office procedure and is done with comfort under a light local anesthesia obtained by using a 10 per cent cocaine solution.

From our experience with this coagulator, we believe medium and small polyps removed by coagulation are less apt to regrow than those removed surgically because we coagulate the blood vessels and lymph vessels in the polyp.

This polyp coagulator can also be used to advantage in chronic vasomotor rhinitis which is not controlled by other treatment. If the needle coagulator is inserted in the posterior third, middle third and anterior third, it will coagulate the submucous tissues of the inferior turbinates, and in a few days there will be shrinking of the tissues that will give the patient much relief.

For vasomotor rhinitis, we advise 3-second coagulation, repeated as necessary, with the controls on the old radiocautery set at 3, and on the new radiocautery set at 6, and using a ground to the patient.

TRANSACTIONS

American Academy of Ophthalmology and Otolaryngology

Official Publication of the American Academy of Ophthalmology and Otolaryngology

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15 Second Street S.W., Rochester, Minnesota

RESULTS OF SURVEY

The survey of Academy membership regarding time and place of future meetings of the Academy has brought in nearly 4900 replies to 6760 mailed, approximately 72 per cent.

The results of the balloting are as follows:

QUESTION 1—*Do you favor a change of date for the annual meeting of the Academy?*

	NO	YES
Ophthalmologists	1768	833
Otolaryngologists	846	530
OALR—LB—PlS—L—LR	590	292
Totals	3204	1655

If so, to what month?

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
OP	65	72	83	81	65	81	30	23	66		95	102
ALR	31	32	41	20	29	35	20	36	148		51	29
OALR, etc.	19	18	15	20	14	31	13	12	60		37	21
Totals	115	122	139	121	108	147	63	71	274		183	152

From this tally, there is no trend toward a seasonal shift, but with the fewer votes for July and August and the somewhat greater vote for September, November and December, it indicates a majority choice for a fall meeting, with October a distinct favorite when viewed in the light of the two to one vote in favor of no change.

QUESTION 2—*Do you favor holding the meeting in a city other than Chicago?*

	NO	YES
Ophthalmologists	1307	1284
Otolaryngologists	756	637
OALR—LB—PlS—L—LR	502	377
Totals	2565	2298

If so, where?

A number of cities were mentioned in which adequate facilities are not available for the type of program the Academy has planned over the past twenty years. Most of the returns that mentioned cities other than Chicago suggested rotating the meetings through East and West Coast cities and back to Chicago once in three or four years. The reason given for rotating, "I would like to see some other places." No place other than Chicago was suggested as superior in facilities, accessibility, convenience and logistics for the usual type of Academy convention.

QUESTION 3—*Is your practice chiefly ALR—OP—OALR—L—LB—LR—PlS?*

The responses to this question served as the basis for the division into specialties in the tallies for Questions 1, 2 and 4.

QUESTION 4—*Would you seriously plan to attend the annual meeting of the American College of Surgeons if it did not conflict with the annual meeting of the Academy?*

	NO	YES
Ophthalmologists	1821	797
Otolaryngologists	871	526
OALR—LB—PlS—L—LR	553	320
Totals	3245	1643

Most reports marked YES carried other comments, such as, "If they had a good program." The replies to this last question are very significant to the Committee. Where a choice must be made between the meetings of the Academy and of the American College of Surgeons, the great majority favored the meetings of the Academy.

Proposed Dates of Future Meetings

	ACADEMY		AMERICAN COLLEGE OF SURGEONS	
1960	Oct. 9-14	Chicago	Oct. 9-14	San Francisco
1961	Oct. 8-13	Chicago	Oct. 1-6	Chicago
1962	Oct. 14-19	Chicago	Oct. 14-19	Atlantic City
1963	Oct. 13-18	Chicago	Oct. 27-Nov. 1	San Francisco

Optional Dates

1962	Oct. 21-26	Chicago
1963	Oct. 20-25	Chicago

A conflict in dates with the American College of Surgeons appears in 1960 and 1962. It is possible for the Academy to avoid the conflict in 1962 by taking the optional date.

None of these dates conflict with religious holidays.

Edwin B. Dunphy, M.D.
Victor Goodhill, M.D.
David Higbee, M.D.
W. L. Benedict, M.D., *Chairman*

PROFESSOR FELIX R. NAGER
1877 - 1959

Professor Felix Nager, who was elected an Honorary Fellow of the American Academy of Ophthalmology and Otolaryngology on October 22, 1925, died after a lingering illness on July 9, 1959, at the age of 81.

"We are very fortunate in having as our guest of honor this year, a man who has the distinction of belonging to the second generation of a family of oto-laryngologists. Dr. Nager's father before him was a prominent otologist of Europe, and Dr. Nager stands pre-eminent in his country today as a man of wide experience in research and as a clinician. In fact, his laboratories have been the envy of all Americans who have visited him during the past few years."

These were the words of President Horace Newhart on October 20, 1925, when he introduced Professor Nager to the assembled members of the Thirtieth Annual Meeting of the American Academy of Ophthalmology and Otolaryngology.

To this he modestly replied, "I have been only a short time in your imposing country, and further am embarrassed by the defects of my English, but I hope to be able to show you what we have been doing the last few years, especially as the result of the training of my two former teachers, Dr. Siebenmann of Basel, and Dr. Bezold of Munich. I will do the best I can." For his oration at this meeting he chose the subject *The Pathology of Deaf-Mutism*, paying tribute again to his two teachers, Bezold and Siebenmann. *Otohistology*, as he wished it to be known, was then a comparatively new field, having begun with the advent of the celloidin technique about 1887.

Felix Robert Nager was born in Basel, Switzerland, in 1877. He was educated in the University of the city of his birth, as well as at Heidelberg and Zurich. He became an assistant in the Oto-rhino-laryngological Clinic at the University of Zurich in 1908, a professor in 1915, and its director in 1923. In one hundred and eighty-eight scientific contributions Nager identified himself with the histology of the ear, and his ardor continued in this direction even beyond his retirement and emeritus status in 1948.

Professor Nager was an understanding clinician and preceptor. His laboratories and his unexcelled material formed the basis of studies of many men who were permitted access to their use. As a gentleman and a scholar, the impact of his influence reached far beyond the confines of his laboratories and his country.

FRANCIS L. LEDERER, M.D.

In Memoriam

Joel Marion Gibbons.....Van Nuys, California
November 16, 1959

Charles William Gosney.....Los Angeles, California
October 10, 1959

Joshua Harley Harris.....Memphis, Tennessee
November 29, 1959

Leonard Warburton Jones.....Rochester, New York
January 13, 1960

Francis Lambert McGannon.....Lakewood, Ohio
December 26, 1959

Thomas Sage.....Detroit, Michigan
November 29, 1959

Henry Lee Sloan.....Charlotte, North Carolina
November 5, 1959

Dean Stanley Smith.....LaCrosse, Wisconsin
October 10, 1959

Eutimio Domenico Tenaglia.....St. Louis, Missouri
October 12, 1959

HOME STUDY COURSES

Secretary: DANIEL SNYDACKER

Associate Secretary: PETER N. PASTORE

OPHTHALMOLOGY

MONTH AND SUBJECT	FACULTY
September EMBRYOLOGY, ANATOMY AND NEURO-ANATOMY	John W. Henderson M. Noel Stow
October PHYSIOLOGY	Robison D. Harley Elmer J. Ballintine
November OPTICS AND PRINCIPLES OF BIOMICROSCOPY	Bourne Jerome Charles J. Campbell
December REFRACTION	Manuel L. Stillerman Bernard C. Gettes
January OCULAR MICRO-BIOLOGY, EXTERNAL DISEASES AND ASEPTIC TECHNIQUE	Henry F. Allen Samuel J. Kimura John F. McKenna
February PERIMETRY AND NEURO-OPHTHALMOLOGY	Robert W. Hollenhorst Edward W. D. Norton John P. Wendland
March EXTRAOCULAR MUSCLES	Hunter H. Romaine Hermann M. Burian
April OPHTHALMOSCOPY AND MEDICAL OPHTHALMOLOGY	Banks Anderson Frank C. Winter George N. Wise
May PATHOLOGY	John S. McGavic Joseph A. C. Wadsworth
June PHARMACOLOGY AND THERAPEUTICS	Alfred J. Kreft John E. Harris Andrew de Roetth, Jr.

CONSULTANTS:

James H. Allen, Conrad Berens, Frederick C. Cordes, Hendrie W. Grant, George P. Guibor, Michael J. Hogan, S. Rodman Irvine, Samuel N. Key, Jr., P. J. Leinfelder, Irving H. Leopold, Cecil W. Lepard, Arthur Linksz, John P. Macnie, Paul T. McAlpine, Raymond E. Meek, Frank W. Newell, C. Wilbur Rucker, Kenneth C. Swan, Georgiana Theobald.

OTOLARYNGOLOGY

MONTH AND SUBJECT	FACULTY
September ANATOMY I	Peter N. Pastore Walter P. Covell Bruce Proctor
October ANATOMY II	Peter N. Pastore Walter P. Covell Bruce Proctor
November HISTOLOGY	Leland G. Hunnicutt Frederic J. Pollack
December PATHOLOGY	George F. Reed Norman Jesberg Joseph H. Ogura
January PHYSIOLOGY	Harold F. Schuknecht Hollie E. McHugh
February MICROBIOLOGY	James W. McLaurin Joseph L. Goldman
March PHARMACOLOGY	G. O. Proud Kinsey M. Simonton
April HEARING FUNCTION AND TESTING	Victor Goodhill Aram Glorig
May VESTIBULAR FUNCTION AND TESTING	David D. DeWeese Edwin A. Stuart
June OTOLOGICAL ACOUSTICS	Donald H. Eldrege Juergen Tonndorf

CONSULTANTS:

H. C. Ballenger, L. W. Dean, Jr., J. Brown Farrior, A. C. Hilding, Arthur L. Juers, Clair M. Kos, Clifford F. Lake, John R. Lindsay, Moses H. Lurie, Carl H. McCaskey, William I. McNally, Werner Mueller, Jack E. Mulsow, Robert E. Priest, Scott N. Reger, Herman Semenov, Ben H. Senturia, G. E. Shambaugh, Jr., Maurice F. Snitman, William C. Thornell, O. E. Van Alyea, Theodore E. Walsh, Henry L. Williams.

The Courses begin on September 1 each year and run continuously for ten months. Enrollment should be completed before August 15.

Application blanks and information may be secured from the Executive Secretary-Treasurer of the Academy: Dr. William L. Benedict, 15 Second Street S.W., Rochester, Minnesota.

THE INTERNATIONAL ASSOCIATION OF SECRETARIES OF OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETIES

PAUL C. CRAIG, M.D., *Editor*
READING, PENNSYLVANIA

The International Association of Secretaries of Ophthalmological and Otolaryngological Societies marked its 22nd year of existence at the October 1959 meeting. Since its inception, the Society has done a great deal to bring about a closer relationship between local, state, and national ophthalmological and otolaryngological societies.

It is important to bear in mind the primary function of our Society and the relationship to the American Academy of Ophthalmology and Otolaryngology which was responsible for its formation. We are pledged to cooperate with the Academy, and to assist them to our fullest extent in whatever help may be necessary to advance the graduate and postgraduate studies in the fields of Ophthalmology and Otolaryngology. It is our duty to aid the secretary of the local ophthalmological and otolaryngological society in promoting good meetings and obtaining excellent speakers.

In too many instances the secretary of the local society is elected for only a one-year term; therefore he may not be able to become efficient in his work. It takes a minimum of five years for a secretary to become successful in this capacity.

Each secretary of an eye, ear, nose and throat society should be informed that our facilities are open to him, and he should avail himself of whatever help we have to offer. Our past president, Dr. Dan DeStio, has written a comprehensive article concerning the duties of a secretary. It covers this field thoroughly so that a new secretary may become very efficient by following this manual. This paper has been published in the TRANSACTIONS of the American Academy of Ophthalmology and Otolaryngology, and I recommend that all secretaries read it. Extra copies are available from the Secretary of The International Association of Secretaries of Ophthalmological and Otolaryngological Societies, Dr. J. David Stratton, Doctors Building, Charlotte 7, North Carolina.

In the past few years, the scope of our Association has become wider by including the secretaries of foreign ophthalmological and otolaryngological societies. The foreign groups are very anxious to exchange ideas and to promote our specialties of ophthalmology and otolaryngology in their respective countries. One must consider that some countries are deficient in the number of trained ophthalmologists and otolaryngologists, and that their medical facilities lack proper postgraduate medical training. In order for them to raise their standards of medical education, outside help is necessary.

It is imperative that organizations such as ours take an interest in these foreign problems and make an effort to assist. We do not mean financial aid necessarily, but rather the establishment of closer friendships by personal correspondence and sending reprints or helpful literature that we have on hand. Many of these men cannot attend our meetings because of financial difficulties.

We, in the United States, are in a better position to travel, so that anyone

of our group who contemplates a trip abroad should include in his itinerary a brief visit with the foreign secretary of an ophthalmological and otolaryngological society, thus establishing a personal relationship. This will help to promote a better understanding among the different international societies.

We regret the passing of Doctor Moacyr Alvaro of Sao Paulo. He performed a magnificent job of promoting a closer relationship between the secretaries of foreign ophthalmological and otolaryngological societies and those in the American societies. His ultimate goal was global achievement in the perfection and advancement of the fields of Ophthalmology and Otolaryngology. We hope that some member of a foreign ophthalmological and otolaryngological society will be inspired to carry on this unfinished task in the spirit of Doctor Alvaro.

MICHAEL H. BARONE
President

BOOK REVIEWS

TREATMENT OF CANCER IN CLINICAL PRACTICE. Edited by Peter B. Kunkler, M.A., M.D. (Cantab.), M.R.C.P., F.F.R., Radiotherapist, University of Birmingham, and Anthony J. H. Rains, M.S. (London), F.R.C.S., Professor of Surgery, University of London, formerly Senior Lecturer in Surgery, University of Birmingham. Printed in England, distributed by Williams and Wilkins Company, Baltimore. Board cover; 806 pp.; freely illustrated. $19.00.

This volume is a treatise on surgical and nonsurgical treatment of cancer to which more than 52 authors have contributed 40 chapters. Special anatomical organs or areas have been considered by specialists who describe the malignant lesions in their respective fields and the effects of radiation and chemical therapy.

Chapters are devoted to the subjects of Physics of Radiotherapy, Principles and Methods of Radiotherapy, and the Aspects of Chemotherapy of Malignant Disease. In the field of otolaryngology are chapters on the Upper Jaw, the Nasal Sinuses and the Nasal Cavity, Mouth and Tongue, Parotid and Salivary Glands, the Middle Ear Cleft, Tonsil and Nasopharynx, Larynx and Laryngopharynx. There is a large chapter on the Eye and Orbit written by Arthur E. Jones and H. B. Stallard.

The work was designed to aid general practitioners as well as specialists and students preparing for postgraduate examinations. The contributors have therefore discussed the clinical features of malignant disease in a particular site only in so far as they have a direct bearing on the problems involved in treatment.

W.L.B.

ATOPIC CATARACT. By Emanuel Rosen, M.D., Lecturer in Biomicroscopy at Newark Eye and Ear Infirmary, Publication Number 373 American Lecture Series, A Monograph in American Lectures in Ophthalmology. Edited by Donald J. Lyle, M.D., Professor of Ophthalmology, College of Medicine, University of Cincinnati. Springfield, Ill., Charles C Thomas, 1960. 93 pp.; 18 illustrations; bibliography of 107 references.

The finding of cataract in persons who exhibit the peculiar dermatological conditions known as "neurodermatitis" was a coincidental item in clinical records until Coca, in 1934, introduced the term "atopic cataract." Thus was a diagnostic entity provided, so that whenever the two conditions were found in one patient, the appropriate label could be applied and such cases segregated for statistical reporting as legitimate additions to the family of allergies. The story of development of the clinical signs of atopic cataract and the significance of the early symptoms is briefly told and ten personally observed cases are described.

W.L.B.

THE MIDDLE EAR. By Heinrich G. Kobrak, M.D., Chicago, University of Chicago Press, 1959. 254 pp. $15.00.

This small volume should prove invaluable to the conscientious otologist. It should be required reading for all otologic interns, and for their instructors if they intend to keep abreast of their students.

H.L.W.

LISTING OF AUDIOMETERS

The following audiometers are recommended for listing as of December 15, 1959:

PURE TONE AUDIOMETERS

Abatron D100	Abatron Inc. P. O. Box 593 Whittier, California
Beltone Model 10-C Model 15-C	Beltone Hearing Aid Company Audiometer Division 2900 West 36th Street Chicago 32, Illinois
Maico Model MA-5 Model H1-B for pure tones only	Maico Electronics Inc. Maico Building 21 North Third Street Minneapolis 1, Minnesota
Sonotone Model 91	Sonotone Corporation Elmsford, New York

SPEECH AUDIOMETERS

Grayson-Stadler Model 162	Grayson-Stadler Co. West Concord, Massachusetts

LIMITED FREQUENCY AUDIOMETERS

Ambco OTO-CHEK 800	Ambco Inc. 1222 W. Washington Blvd. Los Angeles 7, California

SCREENING AUDIOMETERS

Ambco Otometer 600	Ambco Inc. 1222 W. Washington Blvd. Los Angeles 7, California

Each model number in the list as a rule indicates the most advanced model of that series. If less advanced instruments are for sale under similar model numbers, it is assumed that they will function as well or better than the more complicated model in a series.

Acceptance for listing means that the audiometer manufacturer has demonstrated the ability to produce one instrument that performs according to A.S.A. specification. It does not imply that any individual instrument will perform within the tolerances. It is obviously beyond the scope of the Listing Committee or the Referee Laboratories to provide production control for audiometer manufacturers and their customers; however, listing does indicate that the product of the manufacturer can come up to 1951 A.S.A. specifications, and it is up to the customer to carry on negotiation with the manufacturer if a particular instrument which he receives is faulty.

Abstracted from the 1959 Report of the Listing of Audiometers Subcommittee of the American Academy of Ophthalmology and Otolaryngology Committee on Conservation of Hearing.

NEWS AND ANNOUNCEMENTS

AMERICAN BOARD OF OTOLARYNGOLOGY

The American Board of Otolaryngology will conduct only one examination in 1960. This will be from October 3 to 6, 1960, at the Palmer House in Chicago.

BRITISH COLUMBIA OTO-OPHTHALMOLOGICAL CONFERENCE

The 1960 British Columbia Oto-Ophthalmological Conference will be held in Vancouver, B. C., on May 11, 12, and 13. Guest speakers will be Dr. LeRoy A. Schall of Boston, in Otolaryngology, and Dr. Charles L. Schepens of Boston, in Ophthalmology.

There will be lectures, round-table discussions, and film sessions, and a social program for the ladies.

Those interested in attending may obtain further information from Dr. G. A. Badger, 925 West Georgia St., Vancouver, 1, B. C.

MEETINGS

American Society of Facial Plastic Surgery

The Spring Meeting of the American Society of Facial Plastic Surgery was held Wednesday, April 6, 1960, at the Hotel Elysee, New York.

Oscar J. Becker, M.D., Richard T. Farrior, M.D., William Schwartz, M.D., Herbert Friedman, M.D., and Samuel M. Bloom, M.D., took part in the scientific program concerning "Methods of Otoplasty," and Sidney S. Feuerstein, M.D., presented a motion picture concerning this subject.

The Association for Research in Ophthalmology, Inc.

The Midwestern Section of the Association for Research in Ophthalmology will hold its annual meeting in Indianapolis on Saturday and Sunday, April 23 and 24.

The Scientific Session will begin promptly at 9:00 a.m. on April 23, and will be held in the Union Building on the campus of Indiana University Medical Center. The meeting will terminate Sunday noon.

Registration fee will be $2.00, except for residents and research fellows, who will be registered free. Registration will begin Saturday at 8:00 a.m. in room M-124 on the mezzanine of the Union Building.

There will be a luncheon Saturday noon at the Union Building, and a banquet, preceded by a cocktail hour, will be held at the Marrott Hotel on Saturday evening.

Central Illinois Society of Ophthalmology and Otolaryngology

The Thirty-fourth convention of the Central Illinois Society of Ophthalmology and Otolaryngology will be held at the Illinois Hotel in Bloomington, Illinois, on April 22, 23 and 24.

Guest speakers will be John W. Henderson, M.D., of Rochester, Minnesota, representing Ophthalmology, and Z. Z. Godlowski, M.D., Ph.D., of Chicago, representing Otolaryngology.

Society members who will speak are W. A. McNichols, M.D., Dixon, Illinois, in Ophthalmology, and George H. Woodruff, M.D., Joliet, Illinois, in Otolaryngology.

Professor Artur W. Watterson of the Geography Department of the Illinois State Normal School, Bloomington, Illinois, will be the speaker at the Saturday evening banquet.

Irish Ophthalmological Society

The Irish Ophthalmological Society will hold its Annual Meeting in Dublin on May 5, 6 and 7, 1960. The Montgomery

Lecture will be given by Professor Hans Goldmann of Berne in Trinity College, Dublin, on Thursday, May 5.

University of Wisconsin Eye, Ear, Nose and Throat Alumni

The University of Wisconsin Eye, Ear, Nose and Throat Alumni will meet in Madison, October 7 and 8, 1960, preceding the Academy Meeting. A scientific and social program is being planned. There will be no Wisconsin Alumni social function in Chicago in 1960.

West Virginia Academy of Ophthalmology and Otolaryngology

The West Virginia Academy of Ophthalmology and Otolaryngology will hold its annual meeting, April 10 to 12, 1960, at The Greenbrier Hotel in White Sulphur Springs.

Among the guest speakers and their subjects will be:

Dr. Harold G. Scheie, Professor of Ophthalmology, University of Pennsylvania School of Medicine, Philadelphia. The Surgical Management of Glaucoma, Part I and Part II.

Dr. Charles E. Iliff, Associate Professor of Ophthalmology, Johns Hopkins University School of Medicine, Baltimore. Adult Ocular Tumors.

Dr. Oscar T. Becker, Clinical Associate Professor of Otolaryngology, University of Illinois School of Medicine, Chicago. Plastic Surgery in Otolaryngology.

Dr. Helen J. Ossofsky, Assistant Professor of Pediatrics, Georgetown University, Washington, D. C. Pediatric Ocular Tumors.

Dr. John T. Dickinson, Department of Otology, University of Pittsburgh, Pittsburgh. Modern Treatment of Otosclerosis.

There is a nonmember registration fee of $10.00 to cover all the social and scientific sessions. For further information write A. C. Esposito, M.D., Secretary, First Huntington National Bank Building, Huntington, West Virginia.

THE GOULD AWARD

Joel J. Pressman, M.D., of the University of California at Los Angeles, has been selected to be the recipient of the 1959 Gould Award by the International Gould Award Committee. He was chosen because of his anatomic and radioisotope studies of laryngeal compartments.

The Gould Award consists of a plaque and an honorarium of $300.00. It is presented annually for basic research in laryngology to encourage and reward fundamental investigations in this field. The International Committee for the Gould Award for the year 1960 includes Sir Victor Negus, London; Professor Cotoji Satta, M.D., Tokyo; Professor Luzius Ruedi, Zurich; and Hans von Leden, M.D., Medical Director, the William and Harriet Gould Foundation, 30 North Michigan Avenue, Chicago 2.

CASSELBERRY AWARD

A sufficient fund having accrued from the Casselberry Fund for encouraging advancement in the art and science of Laryngology and Rhinology, this sum is now available, in part or as a whole, for a prize award. Theses must be in the hands of the Secretary of the American Laryngological Association prior to January 1 of any given year.

The Award is a prize of money with accompanying certificates signed by the officers of the American Laryngological Association. The sum of money will be agreed upon by the Council of the Association after the manuscript has been evaluated by the Award Committee. It may be awarded in whole or in part among several contestants.

Eligible contestants may be (1) hospital interns, residents, or graduate students in Rhinology and Laryngology; (2) an individual with a degree as Doctor of Medicine who is actively practicing or teaching Rhinology and Laryngology in the Americas; (3) any scientific worker in the field of Rhinology and Laryngology.

Manuscripts shall be presented to the Secretary of the Association under a nom de plume which shall in no way indicate the author's identity. There shall also be a sealed envelope bearing the nom de

plume and containing a card showing the name and address of the contestant, which the Secretary shall keep in his possession.

Manuscripts must be limited to 5000 words and must be typewritten in double spacing on one side of the sheet. The thesis shall not have been published elsewhere before submission.

The successful thesis shall become the property of the American Laryngological Association, but this provision shall in no way interfere with publication of the thesis in the journal of the author's choice. Unsuccessful contributions will be returned promptly to their authors.

The Award, which will be made at the Annual Meetings of the American Laryngological Association, shall be based on:

1. Originality of material
2. Scientific and clinical value
3. Suitability for this Award
4. Method of presentation as to style, illustrations and references

The maximum amount of the Award shall not exceed $200.00.

For further information write to Lyman G. Richards, M.D., Secretary, American Laryngological Association, 12 Clovelly Road, Wellesley Hills 81, Mass.

NATIONAL INDEX ON DEAFNESS, SPEECH AND HEARING

Gallaudet College and the American Speech and Hearing Association have established a National Index on Deafness, Speech and Hearing. This Index will combine the present indexing and abstracting functions of the Central Index of Research on the Deaf at Gallaudet College and the projected indexing and abstracting functions of the American Speech and Hearing Association.

The general policies of the National Index on Deafness, Speech and Hearing will be formulated by a committee composed of representatives of Gallaudet College and representatives of the American Speech and Hearing Association. The Index will be located at Gallaudet College. It will be directed by Dr. Stephen P. Quigley.

The purpose of the National Index is to index and abstract all professional literature pertaining to deafness, speech and hearing and to make this material available to all interested persons. Not only present and future literature, but also all of the relevant past literature will be included. The National Index will make the collected material available through a regular, professional publication. It is believed that the national Index will provide a necessary and useful service to all persons concerned with the problems of deafness, speech and hearing.

The National Index on Deafness, Speech and Hearing is made possible in part by a grant from the Office of Vocational Rehabilitation of the Department of Health, Education and Welfare.

Further information on the Index may be obtained by writing to Dr. Stephen P. Quigley, Director, National Index on Deafness, Speech and Hearing, Gallaudet College, Washington 2, D. C.

EXAMINATION FOR ORTHOPTIC TECHNICIANS

The annual examination of orthoptic technicians by the American Orthoptic Council will be conducted in August and October 1960.

The written examination will be nonassembled and will take place on Thursday, August 18, in certain assigned cities. It will be proctored by designated ophthalmologists.

The oral and practical examinations will be on Saturday, October 8, in Chicago just preceding the meeting of the American Academy of Ophthalmology and Otolaryngology.

Applications for examination will be received by the office of the Chairman of Examinations, Dr. Frank D. Costenbader, 1605 22nd St. N. W., Washington 8, D. C. Each application must be accompanied by the examination fee of $30.00. Applications will not be accepted after July 1, 1960.

SOUTHERN MEDICAL ASSOCIATION
Call for Papers

The Section of Ophthalmology and Otolaryngology of the Southern Medical Association announces that they are now accepting papers by physicians of either specialty living in the area of the Southern Medical Association for consideration for presentation at the next Annual Meeting to be held in St. Louis, Missouri, from October 31 to November 3, 1960.

The paper, or an abstract of the paper, may be sent directly to the Secretary, Albert C. Esposito, M.D., Suite 1212, First Huntington National Bank Building, Huntington, West Virginia, as soon as possible.

TRAINING IN FITTING CONTACT LENSES

Fritz Jardon and associates are offering free training as fitters of contact lenses in their remodeled and expanded laboratories at 905 Kales Building, Detroit 26, Michigan. Nurses have the proper background for this type of work; young men are preferred for this training.

POSITIONS

WANTED — Young doctor completely trained in ophthalmology to join medical group in Virginia. Good opportunity for surgical ophthalmology. Financial return contingent upon individual's efforts. Opportunity available July 1. For further information write J. M. Emmett, M.D., Chief Surgeon, Chesapeake and Ohio Railway Company, Clifton Forge, Va.

WANTED—PHYSICIAN with practice limited to ophthalmology and otolaryngology. Fast-growing, cultural city of 15,000 with good hospital and three general clinics serving a large territory. College town. Principal industry is Federal and State Government agencies, having several hundred employees. Have available space in modern, air-conditioned first floor office. For further information please write H. Lewis Glynn, D.D.S., 302 East Seventh St., Rolla, Missouri.

WANTED — OPHTHALMOLOGIST, Board certified or qualified, to join well-established medical group in San Francisco with aim of working toward partnership. California license required. For further information, please write William B. Skekter, M.D., 2425 Geary Boulevard, San Francisco 15, California.

WANTED—EYE, ENT, OR EENT SPECIALIST. Private Eye, Ear, Nose and Throat Hospital in southwestern Pennsylvania has position available at once. Salary to start, later partnership. No financial investment required. State qualifications and enclose photograph. Room available for bachelor or childless couple. For further information, please write to Charles H. Dow, M.D., or James R. Gemmill, M.D., 130 Seventh Street, Monessen, Pennsylvania.

POSITION WANTED—Opportunity for residency training in ophthalmology. Will be available about July 1, 1960. For consultation, please write Herman J. Hunter, M.D., 439 South Union Drive, Los Angeles, California.

Listings of positions available should be sent to W. L. Benedict, M.D., 15 Second Street S. W., Rochester, Minn., by the fifth of the month preceding publication. They should include (1) type of physician wanted (ophthalmologist or otolaryngologist: diplomate, resident, etc.) (2) type of position to be filled; and (3) whom to write for further information. Unless otherwise requested, listings will be published only once.

The Academy will handle no further correspondence beyond the listing and assume no responsibility. Neither does it endorse nor guarantee any of the published listings.

DIRECTORY OF OPHTHALMIC AND OTOLARYNGIC SOCIETIES

Secretaries of Societies are requested to furnish the information necessary to make this list complete and keep it up to date. Send to TRANSACTIONS, *American Academy of Ophthalmology and Otolaryngology, 15 Second St. S.W., Rochester, Minn.*

EXAMINING AND CERTIFYING BODIES

AMERICAN BOARD OF OPHTHALMOLOGY

CHAIRMAN: Dr. Gordon M. Bruce
SECRETARY-TREASURER: Dr. Merrill J. King, Ivie Rd., Box 236, Cape Cottage Branch, Portland 9, Maine
ORAL EXAMINATION: May 1960, San Francisco; October 1960, Chicago.
FINAL DATE FOR APPLICATION TO TAKE 1961 WRITTEN EXAMINATION: July 1, 1960
WRITTEN EXAMINATION: January 1961; various cities

AMERICAN BOARD OF OTOLARYNGOLOGY

PRESIDENT: Dr. Gordon D. Hoople
SECRETARY-TREASURER: Dr. Dean M. Lierle, University Hospitals, Iowa City
FINAL DATE FOR APPLICATION: April 1, 1960
ORAL EXAMINATION: October 3-7, 1960, Chicago

AMERICAN BOARD OF PLASTIC SURGERY

CHAIRMAN: Dr. James T. Mills
SECRETARY-TREASURER: Dr. Bradford Cannon, 330 Dartmouth St., Boston 16
CORRESPONDING SECRETARY: Estelle E. Hillerich, 4647 Pershing Ave., St. Louis 8
FINAL DATE FOR SUBMITTING CASE REPORTS: January 1, 1960
ORAL AND WRITTEN EXAMINATIONS: May 1960, Milwaukee

THE ROYAL COLLEGE OF PHYSICIANS AND SURGEONS OF CANADA

PRESIDENT: Dr. Robert M. Janes
HONORARY SECRETARY: Dr. James H. Graham, 150 Metcalfe St., Ottawa 4, Ont.

INTERNATIONAL

ASIA-PACIFIC ACADEMY OF OPHTHALMOLOGY

PRESIDENT: Dr. Geminiano deOcampo
SECRETARY-GENERAL: Dr. William John Holmes, 280 Young Hotel Bldg., Honolulu 13, Hawaii
TIME AND PLACE: October 10-13, 1960; Manila, Philippines

EUROPEAN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Dr. J. P. Bailliart
SECRETARY: Prof. Jules Francois, 15 Place de Smet de Naeyer, Ghent, Belgium
TIME AND PLACE: April 1960; Athens, Greece

INTERNATIONAL ASSOCIATION FOR THE PREVENTION OF BLINDNESS

PRESIDENT: Prof. A. Franceschetti
SECRETARY: Dr. J. P. Bailliart, 47 rue de Bellechasse, Paris (7e), France
TIME AND PLACE: December 1962; New Delhi

INTERNATIONAL ASSOCIATION OF SECRETARIES OF OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETIES

PRESIDENT: Michael H. Barone, M.D.
SECRETARY: Dr. J. David Stratton, 1012 Kings Drive, Charlotte, N. C.
TIME AND PLACE: October 11, 1960; Palmer House, Chicago

INTERNATIONAL BRONCHOESOPHAGOLOGICAL SOCIETY

PRESIDENT: Dr. Jo Ono
SECRETARY: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40
TIME AND PLACE: September, 1960; Venice

INTERNATIONAL COLLEGE OF SURGEONS, SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. Clarence H. Albaugh
SECRETARY: Dr. Louis Savitt, 3403 Lawrence Ave., Chicago 25
TIME AND PLACE: May 7-11, 1961; Palmer House, Chicago

INTERNATIONAL FEDERATION OF OPHTHALMOLOGICAL SOCIETIES

PRESIDENT: Sir Stewart Duke-Elder
SECRETARY: Dr. Edward Hartmann, 2 Ave. Ingres, Paris (16e), France
TIME AND PLACE: December 3-7, 1962; New Delhi

INTERNATIONAL ORGANIZATION AGAINST TRACHOMA

PRESIDENT: Prof. G. B. Bietti
SECRETARY-GENERAL: Dr. Jean Sedan, 94 rue Sylvabelle, Marseille (B. du R.), France
TIME AND PLACE: December 1962; New Delhi

PAN-AMERICAN ASSOCIATION OF OPHTHALMOLOGY

PRESIDENT: Dr. Brittain F. Payne
SECRETARY-TREASURER: For North of Panama: Dr. J. Wesley McKinney, 921 Exchange Bldg., Memphis
For South of Panama: Dr. Jorge Balza, Azcuenaga 1059, Buenos Aires, Argentina

PAN-AMERICAN ASSOCIATION OF OTO-RHINO-LARYNGOLOGY AND BRONCHO-ESOPHAGOLOGY

PRESIDENT: Dr. Paul H. Holinger
SECRETARY: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40

FOREIGN

Argentina

SOCIEDAD ARGENTINA DE OFTALMOLOGIA

PRESIDENT: Dr. Paulina Satanowsky de Neumann
SECRETARY: Dr. Atilio L. Norbis, Santa Fé 1171 Capital Federal
TIME AND PLACE: Third Wednesday of each month; Santa Fé 1171, Buenos Aires

SOCIEDAD de OFTALMOLOGIA de CORDOBA

PRESIDENT: Prof. Dr. Alberto Urrets-Zavalia, Jr., Casilla Correo 301, Cordoba, Argentina
SECRETARY: Dr. Claudio Juarez Beltran
SECRETARY-TREASURER: Dr. Luis Mitnik
MEMBERSHIP: Dr. Juan Remonda and Dr. Dante Yadarola

Australia

OPHTHALMOLOGICAL SOCIETY OF AUSTRALIA (B.M.A.)

PRESIDENT: John Antill Pockley
SECRETARY: Dr. John K. Hort, 27 Commonwealth St., Sydney
TIME AND PLACE: October 17-21, 1960; Sydney, Australia

Austria

OSTERREICHISCHE OPHTHALMOLOGISCHE GESELLSCHAFT

PRESIDENT: Prof. Dr. Karl Safar
SECRETARY: Dr. Franz Schwab, I. Univ. Augenklinik, Spitalgasse 2, Wien 9
TIME AND PLACE: June, 1960; Linz, Austria

OSTERREICHISCHE OTO-LARYNGOLOGISCHE GESELLSCHAFT

PRESIDENT: Prof. Dr. Gustav Hofer
SECRETARY: Doz. Dr. Friedrich Neuberger, I. Univ. Ohrenklinik, Alserstr. 4, Vienna 9
TIME: First Tuesday of October to June

OPHTHALMOLOGISCHE GESELLSCHAFT IN WIEN

PRESIDENT: Prof. Dr. A. Pillat
SECRETARY: Dr. H. Schenk, I. Univ. Augenglinik, Alserstr. 4, Vienna 9
TIME: Second Monday—January through December, 2 Univ. Augenklinik, Alserstr. 4, Vienna

Belgium

SOCIETE BELGE D'OPHTALMOLOGIE

SECRETARY: Prof. Dr. M. Applemans, 179 Avenue Ruelens, Louvain
TIME AND PLACE: June 26, 1960, and November 27, 1960; Brussels

Brazil

SOCIEDADE BRASILEIRA DE OFTALMOLOGIA

PRESIDENT: Dr. Pedro Moacyr de Aguiar
SECRETARY-GENERAL: Dr. Carlos Heinrique Bessa, Av. Nilo Pecanha 32, Policlínica Geral de Rio de Janeiro

CENTRO DE ESTUDOS DE OFTALMOLOGIA

PRESIDENT: Dr. Rubens Belfort Mattos
SECRETARY: Dr. Renato de Toledo, R. Condessa de S. Joaquim 288, Sao Paulo
TIME AND PLACE: Every Tuesday; R. Condessa de S. Joaquim 288, Sao Paulo

SOCIEDADE DE OFTALMOLOGIA E OTORRINOLARINGOLOGIA DE RIO GRANDE DO SUL

PRESIDENT: Dr. Paulo Fernando Esteves
SECRETARY: Dr. Carlos Buede, Galeria Chaves, Porto Alegre, Rio Grande do Sul
TIME AND PLACE: Third Wednesday of each month; Porto Alegre, Rio Grande do Sul

Canada

CANADIAN MEDICAL ASSOCIATION, SECTION OF OPHTHALMOLOGY

CHAIRMAN: Dr. Edward F. Foy
SECRETARY: Dr. Robert W. Robertson, 305 Northgate Bldg., Edmonton, Alta.

CANADIAN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Dr. Norman L. Elvin
SECRETARY: Dr. R. G. C. Kelly, 90 St. Clair Ave. W., Toronto 7, Ont.
TIME AND PLACE: June 13-15, 1960; Jasper, Alberta

CANADIAN OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: Dr. Gordon H. Francis
SECRETARY: Dr. Donald M. MacRae, 324 Spring Garden Rd., Halifax, N. S.
TIME AND PLACE: June 10-12, 1960; Jasper National Park, Alta.

THE ROYAL COLLEGE OF PHYSICIANS AND SURGEONS OF CANADA

PRESIDENT: Dr. John Scott
SECRETARY: Dr. James H. Graham, 150 Metcalfe St., Ottawa 4, Ont.

OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY OF ALBERTA

PRESIDENT: Dr. T. C. Wilson
SECRETARY: Dr. M. R. Marshall, North Pavilion, University Hospital, Edmonton, Alta.
TIME AND PLACE: April 1960; Calgary, Alta.

NOVA SCOTIA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. L. F. Doiron
SECRETARY: Dr. C. F. Keays, 324 Spring Garden Rd., Halifax, N. S.

THE MONTREAL MEDICO-CHIRURGICAL SOCIETY, SECTION ON OTOLARYNGOLOGY
PRESIDENT: Dr. H. E. McHugh
SECRETARY: Dr. Paul Ittkin, 600 Medical Arts Bldg., Montreal 25, Que.
TIME AND PLACE: November, January, February and April; Teaching Hospitals

MONTREAL OPHTHALMOLOGICAL SOCIETY
PRESIDENT: Dr. R. Cloutier
SECRETARY: Dr. Bruce Ramsey, 1414 rue Drummond, Montreal, Que.

TORONTO ACADEMY OF MEDICINE, SECTION OF OPHTHALMOLOGY
PRESIDENT: Dr. Lois A. Lloyd
SECRETARY: Dr. John W. Hiltz, 741 Bayview Ave., Toronto, Ont.

Chile

SOCIEDAD CHILENA DE OFTALMOLOGIA
PRESIDENT: Dr. Cristóbal Espíldora-Luque
SECRETARY: Dr. José Espíldora-Couso, Agustinas 715, Santiago

Colombia

SOCIEDAD COLOMBIANA DE OFTALMOLOGIA Y OTO-RINO-LARINGOLOGIA
PRESIDENT: Dr. Francisco Vernaza
SECRETARY: Dr. Alberto Jimeno, Carrera 6, No. 35-38, Bogotá
TIME AND PLACE: Monthly; Bogotá

Cuba

SOCIEDAD CUBANA DE OFTALMOLOGIA
PRESIDENT: Dr. Manuel Iglesias Revuelta
SECRETARY: Dr. Jaime Alemany Martorell, 23 #301 esq. aL, Vedado, LaHabana
TIME: Annual in December

Denmark

DET OFTALMOLOGISKE SELSKAB I KØBENHAVN
PRESIDENT: Dr. Henning Skydsgaard
SECRETARY: Dr. Poul M. Møller, University Eye Clinic, Copenhagen
TIME: April 1960

Egypt

OPHTHALMOLOGICAL SOCIETY OF EGYPT
PRESIDENT: Dr. Ibrahim Ahmed Abboud
SECRETARY: Dr. Sabri Kamel, 44 Opera Sq., Cairo

France

SOCIETE FRANCAISE D'OPHTALMOLOGIE
PRESIDENT: Prof. Guy Offret
SECRETARY: Dr. Gabriel Lombard, 27 rue du Faubourg, St. Jacques, Paris
TIME AND PLACE: Maison de la Chimie, 28 rue Saint Dominique, Paris

SOCIETE FRANCAISE D'OTO-RHINO-LARYNGOLOGIE
PRESIDENT: Prof. André Soulas
SECRETARY: Dr. Henry Guillon, 6 Av. MacMahon, Paris
TIME AND PLACE: October 10, 1960; Ancienne Faculté de Médecine, Rue de l'Ecole de Médecine, Paris

Germany

DEUTSCHE OPHTHALMOLOGISCHE GESELLSCHAFT
PRESIDENT: Prof. Dr. Gasteiger
SECRETARY: Prof. Dr. Jaeger, Univ. Augenklinik, Heidelberg
TIME AND PLACE: September 29, 1960; West Berlin

Great Britain

BRITISH ASSOCIATION OF OTOLARYNGOLOGY
PRESIDENT: Mr. C. Gill-Carey
SECRETARY: Mr. G. H. Bateman, 47 Lincoln's Inn Fields, London, W. C. 2

MIDLAND OPHTHALMOLOGICAL SOCIETY
PRESIDENT: Mrs. D. R. Campbell
SECRETARIES: M. J. Roper-Hall and W. Martin Walker, Birmingham and Midland Eye Hospital
TIME AND PLACE: Annual General Meeting, September 23, 1960; Birmingham and Midland Eye Hospital

FACULTY OF OPHTHALMOLOGISTS
PRESIDENT: Mr. E. G. Mackie
SECRETARY: Mr. E. F. King, 47 Lincoln's Inn Fields, London W. C. 2

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM
PRESIDENT: Mr. R. C. Davenport
SECRETARIES: Mr. E. C. Glover, 47 Lincoln's Inn Fields, London, W. C. 2
Mr. L. G. Fison, 47 Lincoln's Inn Fields, London, W. C. 2

OXFORD OPHTHALMOLOGICAL CONGRESS
MASTER: Mr. O. M. Duthie
SECRETARY: Mr. Ian C. Fraser, 21 Dogpole, Shrewsbury, Shropshire
TIME AND PLACE: July 11-13, 1960; University Laboratory of Physiology, South Parks Rd., Oxford

THE ROYAL SOCIETY OF MEDICINE, SECTION OF OPHTHALMOLOGY
PRESIDENT: Mr. J. R. Wheeler
SECRETARIES: Mr. D. P. Greaves, 56 Wimpole St., London, W. 1
Mr. J. H. Dobree, 116 Wood St., Barnet, Herts.
TIME AND PLACE: Second Thursday, October through December, February through June; 1 Wimpole St., London, W. 1.

THE ROYAL SOCIETY OF MEDICINE, SECTION OF OTOLOGY

PRESIDENT: Mr. J. P. Monkhouse
SECRETARY: Mr. E. F. Stewart, 33 Alwgue Road, Canonbury London N.1
TIME AND PLACE: First Friday, November through June, except January and April; 1 Wimpole St., London W. 1.

THE ROYAL SOCIETY OF MEDICINE, SECTION OF LARYNGOLOGY

PRESIDENT: Myles L. Formby, F.R.C.S.
SECRETARY: Mr. I. B. Thorburn, 160 Whitegate Dr., Blackpool
TIME AND PLACE: May 6, and July 15, 1960; Royal Society of Medicine

SCOTTISH OPHTHALMOLOGICAL CLUB

PRESIDENT: Dr. J. R. Paterson
SECRETARIES: Dr. C. R. S. Jackson, 1 Melville St., Edinburgh 3
Dr. D. Christison, 21 Eastcote Ave., Glasgow, W. 4

SOUTHERN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Mrs. Janet Simpson, M.B., Ch.B., D.O.
SECRETARY: Nigel Cridland, D.M., D.O.
TIME AND PLACE: Annual Meeting October 29, 1960; Southampton Eye Hospital

India

ALL-INDIA OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Dr. Tulsidas
SECRETARY: Dr. Y. K. C. Pandit, Bombay Mutual Bldg., Fort, Bombay 1

OPHTHALMOLOGICAL SOCIETY OF BENGAL

PRESIDENT: Major H. K. Indra
SECRETARIES: Dr. A. K. Sen and Dr. A. N. Basu, 3 Lakeview Rd., Bengal
PLACE: The Eye Infirmary, Calcutta Medical College, West Bengal

BOMBAY OPHTHALMOLOGICAL ASSOCIATION

PRESIDENT: Dr. S. N. Cooper
SECRETARY: Dr. A. M. Gokhale, A-4 Sahakar Nivas, Off Gokhale Road South, Bombay 28, India
TIME AND PLACE: 7:30 p.m., Third Wednesday of each month; various hospitals

Ireland

IRISH OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Dr. B. Lynn
SECRETARY: Dr. T. F. Roche, 2S FitzWilliam Pl., Dublin
TIME AND PLACE: May 5-7, 1960, Dublin

The Netherlands

NEDERLANDSCH OOGHEELKUNDIG GEZELSCHAP

PRESIDENT: Prof. Dr. M. C. Colenbrander
SECRETARY: Dr. P. G. Binkhorst, Sweelincklaan 20, Bilthoven

New Zealand

THE OPHTHALMOLOGICAL SOCIETY OF NEW ZEALAND

PRESIDENT: Dr. R. G. MacDonald
SECRETARY: Dr. Randal Elliott, 89 The Terrace, Wellington C1, N.2
TIME AND PLACE: October 1960; Christchurch, New Zealand

Norway

NORSK OFTALMOLOGISK FORENING

PRESIDENT: Dr. Einar Trumpy
SECRETARY: Dr. Hans Peter Petersen, Rikshospitalets Øyeavdeling, Oslo
TIME AND PLACE: Four times a year; Rikshospitalets Øyeavdeling, Oslo

Pakistan

OPHTHALMOLOGICAL SOCIETY OF PAKISTAN

PRESIDENT: Lt. Gen. W. A. Burki
SECRETARY: Dr. Raja Mumtaz, 70 Nedous Hotel, Lahore

Paraguay

SOCIETY OF OPHTHALMOLOGY OF PARAGUAY

PRESIDENT: Dr. Honorio Campuzano
SECRETARY: Emilio Gonzales Gini, Estados Unidos 183 Asunción, Paraguay
TIME AND PLACE: Monthly; Circulo Paraguayo de Medicos, Asunción

Philippine Islands

PHILIPPINE SOCIETY OF OTOLARYNGOLOGY AND BRONCHOESOPHAGOLOGY

PRESIDENT: Cesar F. Villafuerte, M.D.
SECRETARY-TREASURER: Eusebio E. Llamas, M.D., 492 Padre Faura Street, Manila, Philippines

Portugal

SOCIEDADE PORTUGUESA DE
OTORRINOLARINGOLOGIA E DE BRONCO-ESOFAGOLOGIA

PRESIDENT: Dr. Alberto Luís de Mendonca
SECRETARIES: Dr. Antonio da Costa Quinta, Av. da Liberdade 65, Lisbon 1
Dr. Albano Coelho, Av. da Liberdade 65, Lisbon 1

Spain

SOCIEDAD OFTALMOLOGICA HISPANO-AMERICANA

PRESIDENT: Prof. Dr. José Pérez-Llorca
SECRETARY: Dr. Carlos Costi García de Tuñón, Montalban 7, Madrid

Sweden

SVENSKA OGONLAKAREFORENINGEN,
SVENSKA LAKARESALLSKAPETS SEKTION FOR OFTALMOLOGI

PRESIDENT: Prof. Dr. G. Karpe
SECRETARY: Dr. Ilmari Rendahl, Eye Clinic Karolinska Sjukhuset, Stockholm 60

Union of South Africa

THE OPHTHALMOLOGICAL SOCIETY OF SOUTH AFRICA

PRESIDENT: Dr. J. Graham Scott
SECRETARY: Dr. E. T. Meyer, 220 Lister Bldg., Jeppe St., Johannesburg

Venezuela

SOCIEDAD VENEZOLANA DE OTORINOLARINGOLOGIA

PRESIDENT: Dr. V. Marquez Reveron
SECRETARY: Dr. R. Marquez Landaeta, Colegio de Medicoa, Los Chaguaramos Caracas, Venezuela

NATIONAL

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dean M. Lierle, M.D.
EXECUTIVE SECRETARY-TREASURER: William L. Benedict, M.D., 15 Second St. S.W., Rochester, Minn.
TIME AND PLACE: October 9-14, 1960; Palmer House, Chicago

AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION

PRESIDENT: Verling K. Hart, M.D.
SECRETARY: F. Johnson Putney, M.D., 1712 Locust St., Philadelphia 3, Pa.

AMERICAN LARYNGOLOGICAL ASSOCIATION

PRESIDENT: W. J. McNally, M.D.
SECRETARY: Lyman G. Richards, M.D., 12 Clovelly Road, Wellesley Hills 81, Mass.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

PRESIDENT: Theodore E. Walsh, M.D.
SECRETARY: C. Stewart Nash, M.D., 708 Medical Arts Bldg., Rochester 7, N. Y.

EASTERN SECTION

PRESIDENT: F. Johnson Putney, M.D.
SECRETARY: David W. Brewer, M.D., 1100 Genesee St., Syracuse, N. Y.
TIME AND PLACE: January, 1961; Hotel Warwick, Philadelphia

MIDDLE SECTION

PRESIDENT: George E. Shambaugh, Jr., M.D.
SECRETARY: Marlow W. Manion, M.D., 601 Hume Mansur Bldg., Indianapolis 4

SOUTHERN SECTION

SECRETARY: James A. Harrill, M.D., Bowman Gray School of Medicine, Winston-Salem, N. C.

WESTERN SECTION

PRESIDENT: Rex L. Murphy, M.D.
SECRETARY: Francis A. Sooy, M.D., 490 Post St., San Francisco

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY,
OTOLOGY AND RHINOLOGY

CHAIRMAN: Paul H. Holinger, M.D.
SECRETARY: Walter E. Heck, M.D., Stanford Hospital, San Francisco 15
TIME AND PLACE: June 13-17, 1960; Miami Beach

AMERICAN MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY

CHAIRMAN: Harold G. Scheie, M.D.
SECRETARY: Henry F. Allen, M.D., 200 Beacon St., Boston
TIME AND PLACE: June 13-17, 1960; Miami Beach

AMERICAN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Algernon B. Reese, M.D.
SECRETARY-TREASURER: Maynard C. Wheeler, M.D., 30 W. 59th St., New York 19
TIME AND PLACE: May 16-18, 1960; Broadmoor Hotel, Colorado Springs

AMERICAN OTOLOGICAL SOCIETY, INC.

PRESIDENT: Robert C. Martin, M.D.
SECRETARY-TREASURER: Lawrence R. Boies, M.D., University Hospital, Minneapolis 14

THE AMERICAN OTORHINOLOGIC SOCIETY FOR PLASTIC SURGERY, INC.

PRESIDENT: Raymond S. Rosedale, M.D.
SECRETARY: Joseph G. Gilbert, M.D., 75 Barberry Lane, Roslyn Heights, N. Y.

AMERICAN SOCIETY OF FACIAL PLASTIC SURGERY

PRESIDENT: Oscar J. Becker, M.D.
SECRETARY: Samuel M. Bloom, M.D., 123 E. 83rd St., New York 28

AMERICAN SOCIETY OF OPHTHALMOLOGIC AND OTOLARYNGOLOGIC ALLERGY

PRESIDENT: Walter E. Owen, M.D.
SECRETARY: Daniel S. De Stio, M.D., 1006 Highland Bldg., Pittsburgh 6
TIME AND PLACE: October 9-14, 1960; Palmer House, Chicago

ASSOCIATION FOR RESEARCH IN OPHTHALMOLOGY, INC.

CHAIRMAN: James Allen, M.D.
SECRETARY-TREASURER: Lorand V. Johnson, M.D., 10515 Carnegie Ave., Cleveland 6
TIME AND PLACE: June 13-17, 1960; Eden Roc Hotel, Miami

NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

PRESIDENT: Ira V. Hiscock, Sc.D.
EXECUTIVE DIRECTOR: John W. Ferree, M.D.
SECRETARY: Regina E. Schneider, 1790 Broadway, New York 19

OTOSCLEROSIS STUDY GROUP

PRESIDENT: E. H. Campbell, M.D.
SECRETARY: Raymond Jordan, M.D., 121 University Place, Pittsburgh
TIME AND PLACE: October 9-14, 1960; Palmer House, Chicago

PUERTO RICAN MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Antonio Rullán, M.D.
SECRETARY: Ophthalmology: Carlos J. Margarida, M.D., Box 9111, Santurce
Otolaryngology: Lorenzo Arsuaga, M.D., Box 9111, Santurce

PUERTO RICAN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: José Fiol Bigas, M.D.
SECRETARY: Guillermo Picó, M.D., 1475 Wilson Ave., Santurce
TIME AND PLACE: Bimonthly: Puerto Rican Medical Association Bldg.

SOCIETY OF MILITARY OPHTHALMOLOGISTS

PRESIDENT: Aubrey Jennings, M.D.
SECRETARY: Capt. Don W. Longfellow, MC, USA, Armed Forces Institute of Pathology, WRAMC, Washington 12, D. C.
TIME AND PLACE: October 9-14, 1960; Palmer House, Chicago

SOCIETY OF MILITARY OTOLARYNGOLOGISTS

PRESIDENT: Capt. Maurice Schiff, MC, USN
SECRETARY-TREASURER: Col. James E. Lett, MC, USAF, 209 South Tamworth, San Antonio

REGIONAL

ARK-LA-TEX OTO-OPHTHALMIC SOCIETY

PRESIDENT: Jack W. Pou, M.D.
SECRETARY: Richard Gibson, M.D., Doctors Bldg., Margaret Place, Shreveport, La.
TIME AND PLACE: 7:00 p.m., First Monday of each month, September through June; Confederate Memorial Hospital, Shreveport, La.

INTER-MOUNTAIN OTO-OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Wilson Hales, M.D.
SECRETARY: Don B. McAffee, M.D., 508 E. South Temple, Salt Lake City
TIME AND PLACE: 7:00 p.m., Third Monday of each month; University Club, Salt Lake City

LOUISIANA-MISSISSIPPI OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: Lucian W. Alexander, M.D.
SECRETARY: Edley H. Jones, M.D., 1301 Washington St., Vicksburg, Miss.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Brendan D. Leahey, M.D.
SECRETARY: Warren D. Haley, M.D., 78 Church St., Winchester, Mass.
TIME AND PLACE: Third Wednesday, November through April; Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston

NEW ENGLAND OTO-LARYNGOLOGICAL SOCIETY

PRESIDENT: Frank Turchik
SECRETARY: Burton E. Lovesey, M.D., 15 W. Central St., Natick, Mass.
PLACE: Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

PRESIDENT: John F. Tolan, M.D.
SECRETARY: Homer E. Smith, M.D., 686 12th Ave., Salt Lake City 3
TIME AND PLACE: May 22-26, 1960; Hotel St. Francis, San Francisco

SIOUX VALLEY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: W. P. Davey, M.D.
SECRETARY: Verne R. Heimann, M.D., 501 Insurance Exchange Bldg., Sioux City, Iowa

SOUTHERN MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

CHAIRMAN: Dr. George M. Haik
SECRETARY: Dr. Alberto C. Esposito, First Huntington National Bank Bldg., Huntington, W. Va.
TIME AND PLACE: October 31-November 3, 1960; St. Louis

WISCONSIN-UPPER MICHIGAN SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. Cyril J. Radl
SECRETARY: Dr. G. L. McCormick, 650 S. Central Ave., Marshfield, Wis.
TIME AND PLACE: May 1960; Marshfield, Wis.

STATE AND LOCAL

Alabama

ALABAMA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: John Allen Jones, M.D.
SECRETARY: Karl Benkwith, M.D., 14 Catoma St., Montgomery

THE BIRMINGHAM EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Each member in alphabetical order
SECRETARY: Joseph M. Dixon, M.D., 2156 Highland Ave., Birmingham 5
TIME AND PLACE: Monthly; The Club

Arizona

PHOENIX OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Oscar W. Thoeny, M.D.
SECRETARY: Rex W. Weaver, M.D., 1150 North Country Club Drive, Mesa, Ariz.
TIME AND PLACE: 7:00 p.m., Second Thursday bimonthly, September through May; Westward Ho Hotel

Arkansas

ARKANSAS MEDICAL SOCIETY, EYE, EAR, NOSE AND THROAT SECTION

PRESIDENT: Max McAllister, M.D.
SECRETARY: James L. Smith, M.D., 623 Woodlane, Little Rock

California

CALIFORNIA MEDICAL ASSOCIATION, EYE SECTION

PRESIDENT: Earle H. McBain, M.D.
SECRETARY: Floyd M. Bond, M.D., 625 Broadway, San Diego

CALIFORNIA MEDICAL ASSOCIATION, EAR, NOSE AND THROAT SECTION

PRESIDENT: Ewing Seligman, M.D.
SECRETARY: H. W. Kohlmoos, M.D., 426 17th St., Oakland

ALTA CALIFORNIA OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Byron Demorest, M.D.
SECRETARY: Scharrold O. Adams, 2740 Fulton Ave., Sacramento
TIME AND PLACE: Third Thursday of each month, September through June; Sutter Club, Sacramento

EAST BAY OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Stuart B. Stephens, M.D.
SECRETARY: Raymond R. Johanson, M.D., 509 American Trust Bldg, 2140 Shattuck Avenue, Berkeley 4, Calif.

LOS ANGELES OPHTHALMOLOGICAL JOURNAL CLUB

PRESIDENT: Charles J. Aucreman, M.D.
SECRETARY: Arthur S. Gray, M.D., 301 N. Prairie Ave., Inglewood
TIME AND PLACE: 8:00 p.m., Second Monday of each month, September through June; Los Angeles County Medical Association Bldg., 1925 Wilshire Blvd., Los Angeles

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Wendell C. Irvine, M.D.
SECRETARY: Herschel H. Burston, M.D., 6333 Wilshire Blvd., Los Angeles 48
TIME AND PLACE: Ophthalmology, 6:00 p.m., First Thursday of each month;
Otolaryngology, 6:00 p.m., Fourth Monday of each month;
Los Angeles County Medical Association Bldg., 1925 Wilshire Blvd., Los Angeles

PENINSULA EYE SOCIETY

PRESIDENT: Robert D. Cook, M.D.
SECRETARY: Frank D. Berry, M.D., 762 Altos Oaks Drive, Altos, Calif.
TIME: Third Thursday evening of each month

SAN DIEGO OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Oscar G. Ravin, M.D.
SECRETARY: Cody L. Smith, M.D., 125 Prescott Avenue, El Cajon, Calif.
TIME AND PLACE: 6:00 p.m., Second Monday of each month; University Club, San Diego

SAN FRANCISCO MEDICAL SOCIETY, EYE SECTION

CHAIRMAN: Dr. William Ferguson, 490 Post Street, San Francisco
TIME AND PLACE: Quarterly; San Francisco County Medical Society Bldg.

SAN FRANCISCO OPHTHALMOLOGICAL ROUND TABLE

PRESIDENT: Homer P. Howell, M.D.
SECRETARY-TREASURER: Albert J. Brinckerhoff, M.D., 490 Post St., San Francisco 2

SANTA BARBARA OPHTHALMOLOGICAL SOCIETY

PRESIDENT: John M. Richards, M.D.
SECRETARY: F. J. Kanofsky, M.D., 1921 State Street, Santa Barbara, Calif.
TIME AND PLACE: 7:30 p.m., Fourth Thursday evening of each month, St. Francis Hospital Library

TRI-COUNTY SOCIETY OF OPHTHALMOLOGY

PRESIDENT: Albert Biegel, M.D.
SECRETARY: Gordon Witter, M.D., 2 W. Fern Ave., Redlands

Colorado

COLORADO OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Gertrude S. Hausmann, M.D.
SECRETARY: Max Kaplan, M.D., 216 Republic Bldg., Denver 2
TIME AND PLACE: Third Saturday of each month, September through May; University of Colorado Medical Center, 4200 E. Ninth Ave., Denver

COLORADO OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: James Rigg, M.D.
SECRETARY: Kemp Cooper, M.D., 2627 E, Denver
TIME AND PLACE: First Saturday of each month; Denver County Medical Library

Connecticut

CONNECTICUT STATE MEDICAL SOCIETY, EYE, EAR, NOSE AND THROAT SECTION

PRESIDENT: Clement C. Clarke, M.D.
SECRETARY: John P. Simses, M.D., 144 Golden Hill St., Bridgeport

District of Columbia

MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA, SECTION ON OPHTHALMOLOGY

PRESIDENT: Walter J. Romejko, M.D.
SECRETARY-TREASURER: Paul E. Zehfuss, M.D., 1830 K St. N.W., Washington, D. C.

MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA, SECTION ON OTOLARYNGOLOGY

PRESIDENT: Morris Krucoff, M.D.
SECRETARY: Adrian Delaney, M.D., 121 N. Washington, Alexandria, Va.
TIME AND PLACE: 6:30 p.m., Second Tuesday of November, January, March and May; Army Navy Club

Florida

FLORIDA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: G. Dekle Taylor, M.D.
SECRETARY: Joseph Taylor, Jr., M.D., One Davis Bldg., Tampa

GREATER MIAMI EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Mariano C. Caballero, M.D.
SECRETARY-TREASURER: H. Carlton Howard, M.D., Suite 219, Plaza Bldg., 245 S. E. First St., Miami 32
TIME AND PLACE: Quarterly; McAllister Hotel

Georgia

GEORGIA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: John Kirk Train, M.D.
SECRETARY: Walter P. Rhyne, M.D., P. O. Box 206, Albany

ATLANTA EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Dr. J. J. Stokes
SECRETARY: Dr. Edward L. Askren, Jr., 340 Boulevard, N. E., Atlanta
TIME AND PLACE: 7:30 p.m., Fourth Monday of each month; Fulton County Academy of Medicine

Hawaii

HAWAII EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Howard H. Honda, M.D.
SECRETARY: Herbert G. Pang, M.D., Suite 202, Nuuanu Medical Center, 1374 Nuuanu Avenue, Honolulu 17, Hawaii
TREASURER: Harold T. Kimata, M.D.
TIME AND PLACE: Third Thursday of each month; Pacific Club

Illinois

CENTRAL ILLINOIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. G. E. Hartenbower
SECRETARY: Dr. C. L. Pannabecker, 434 Jefferson Bldg., Peoria, Ill.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

PRESIDENT: George H. Woodruff, M.D.
SECRETARY: Robert Lewy, M.D., 25 E. Washington St., Chicago 2
TIME AND PLACE: First Monday of each month, October through May; Furniture Club of America, 666 N. Lake Shore Dr., Chicago

CHICAGO OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Clifford P. Sullivan, M.D.
SECRETARY: David Shoch, M.D., 700 North Michigan Ave., Chicago 11
TIME AND PLACE: Third Monday of each month; Illini Union, 715 S. Wood St., Chicago

Indiana

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: John Flick, M.D.
SECRETARY: J. Lawrence Sims, M.D., 3400 N. Meridian St., Indianapolis
TIME AND PLACE: May 4 and 5, 1960; Union Bldg., Purdue University, West Lafayette

INDIANAPOLIS OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: John R. Swan, M.D.
SECRETARY: Theodore R. LeMaster, M.D., 304 Hume Mansur Bldg., Indianapolis
TIME AND PLACE: 6:30 p.m., Second Thursday of each month, November through May; Indianapolis Athletic Club

Iowa

IOWA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Arthur Downing, M.D.
SECRETARY: William Huffman, M.D., University Hospitals, Iowa City

DES MOINES ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. Chester Woodburn
SECRETARY: Dr. Robert H. Foss, 610 Equitable Bldg., Des Moines, Iowa
TIME AND PLACE: Fourth Monday of March and April, Des Moines Club

Kansas

KANSAS STATE MEDICAL SOCIETY, SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Victor R. Moorman, M.D.
SECRETARY: James E. Bresette, M.D., 659 New Brotherhood Bldg., Kansas City

Kentucky

LOUISVILLE EYE AND EAR SOCIETY

PRESIDENT: Thomas E. Booth, M.D.
SECRETARY: Roderick MacDonald, Jr., M.D., Louisville General Hospital, Louisville
TIME AND PLACE: Bimonthly; Provincial House

Louisiana

NEW ORLEANS GRADUATE MEDICAL ASSEMBLY

PRESIDENT: Ambrose H. Storck, M.D.
SECRETARY: Mannie D. Paine, Jr., M.D., Room 103, 1430 Tulane Ave., New Orleans

Maryland

BALTIMORE CITY MEDICAL SOCIETY, OPHTHALMOLOGICAL SECTION

PRESIDENT: J. E. Brumback, Jr., M.D.
SECRETARY: Roy O. Scholz, M.D., 11 E. Chase St., Baltimore 2
TIME AND PLACE: Three times yearly; Medical and Chirurgical Faculty Building, 1211 Cathedral St., Baltimore 1

BALTIMORE EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Arthur T. Ward, Jr., M.D.
SECRETARY: Robert Z. Berry, M.D., Medical Arts Bldg., Baltimore 1
TIME AND PLACE: Quarterly; October to May, University Club, Baltimore

Massachusetts

MASSACHUSETTS MEDICAL SOCIETY,
SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

CHAIRMAN: M. Stuart Strong, M.D.
SECRETARY: Robert E. Klotz, M.D., 243 Charles St., Boston 14
TIME AND PLACE: May 1960; Hotel Statler, Boston

BOSTON CITY HOSPITAL AURAL AND OPHTHALMIC ALUMNI SOCIETY

PRESIDENT: Arthur J. Gorney, M.D.
SECRETARY: Anthony Alba, M.D., 199 Bay State Rd., Boston

Michigan

MICHIGAN STATE MEDICAL SOCIETY, SECTION ON OPHTHALMOLOGY

CHAIRMAN: Fleming A. Barbour, M.D.
SECRETARY: Paul L. Cusick, M.D., 28 W. Adams Ave., Detroit 26

MICHIGAN STATE MEDICAL SOCIETY, SECTION ON OTOLARYNGOLOGY

CHAIRMAN: John E. Magielski, M.D.
SECRETARY: Vital Cortopassi, M.D., 324 S. Washington, Saginaw, Mich.

MICHIGAN TRIOLOGICAL SOCIETY

PRESIDENT: R. T. Blackhurst, M.D.
SECRETARY: Roland L. Phillips, M.D., 403 Matthews Bldg., Owosso
TIME AND PLACE: Five times yearly; Lansing or Marshall

DETROIT OPHTHALMOLOGICAL CLUB

PRESIDENT: Members in rotation
SECRETARY: John W. Henderson, M.D., Outpatient Bldg., University Hospital, Ann Arbor
TIME AND PLACE: Second Tuesday of November, December, February, and March; Wayne County Medical Society Bldg., Detroit

DETROIT OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Wesley Reid, M.D.
SECRETARY: Lester E. McCullough, M.D., 521 David Whitney Bldg., Detroit 26
TIME AND PLACE: Fourth Thursday of each month, November through April; Wayne County Medical Society Bldg.

DETROIT OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: Ned I. Chalat, M.D.
SECRETARY: Harold Schuknecht, M.D., Henry Ford Hospital, Detroit
TIME AND PLACE: 7:00 p.m., Third Wednesday of each month; Wayne County Medical Society Bldg., Detroit

SAGINAW VALLEY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: William Knapp, M.D.
SECRETARY: Arno Weiss, M.D., 3521 State St., Saginaw
TIME AND PLACE: First Tuesday of each month; High-Life Inn, Saginaw

Minnesota

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Walter Lees Hoffman, M.D.
SECRETARY: John P. Wendland, M.D., 203 Doctors Bldg., Minneapolis 2
TIME AND PLACE: Second Friday of each month; Minneapolis Club, Minneapolis; Minnesota Club, St. Paul

Missouri

KANSAS CITY SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Byron J. Ashley, M.D.
SECRETARY: James T. Robison, Jr., M.D., 4620 J. C. Nichols Pkwy., Kansas City 12
TIME AND PLACE: Third Thursday of each month, September to May; University of Kansas Medical Center

EAR, NOSE AND THROAT CLUB OF ST. LOUIS

CHAIRMAN, EXECUTIVE COMMITTEE: W. B. Harkins, M.D.
SECRETARY: Daniel D. Klaff, M.D., 3720 Washington Blvd., St. Louis 8
TIME AND PLACE: Third Wednesday of January, March, May and November; University Club

ST. LOUIS OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Edmund B. Alvis, M.D.
SECRETARY: Lawrence T. Post, Jr., M.D., 100 N. Euclid, St. Louis 8
TIME AND PLACE: Third Wednesday of January, March, May and November; University Club

Montana

MONTANA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Cecil Hall, M.D.
SECRETARY: James Morrison, M.D., 1241 N. Broadway, Billings

Nebraska

NEBRASKA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Robert Lovgren, M.D.
SECRETARY: George Alliband, M.D., 1020 Medical Arts Bldg., Omaha
TIME: May and September

OMAHA EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Frank Lipp, M.D.
SECRETARY: Richard C. Greenberg, M.D., 1421 Dodge St., Omaha
TIME AND PLACE: Third Wednesday of January, March, May, September, and November; Omaha Club, 20th and Douglas, Omaha

New Jersey

ACADEMY OF MEDICINE OF NEW JERSEY, EYE, EAR, NOSE AND THROAT SECTION

CHAIRMAN: Myron J. Shapiro, M.D.
SECRETARY: H. L. Moskowitz, M.D., 1038 Clinton Ave., Irvington, N. J.

MEDICAL SOCIETY OF NEW JERSEY, SECTION ON OPHTHALMOLOGY

PRESIDENT: Jay E. Mishler, M.D.
SECRETARY: Louis Amdur, M.D., 15 Exchange Place, Jersey City 2
TIME AND PLACE: May 14-18, 1960; Haddon Hall, Atlantic City

NEW JERSEY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Albert Moriconi, M.D.
SECRETARY: John Scillieri, M.D., 660 Broadway, Paterson
TIME AND PLACE: May, 1960, Atlantic City

NEW JERSEY OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Louis Amdur, M.D.
SECRETARY: Alfonse A. Cinotti, M.D., 3285 Hudson Blvd., Jersey City
TIME AND PLACE: May, 1960, Atlantic City

NEW JERSEY SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Edgar P. Cardwell, M.D.
SECRETARY: Albert F. Moriconi, M.D., 438 Hamilton Ave., Trenton 9

HUDSON COUNTY EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT AND SECRETARY: Nathaniel J. Shapiro, M.D., 1201 Palisade Ave., Union City
TIME AND PLACE: Second Monday of each month; Pete and Dominic Restaurant, Jersey City

New Mexico

NEW MEXICO OPHTHALMOLOGICAL SOCIETY

PRESIDENT: J. A. Dillahunt, M.D.
SECRETARY: James T. McGuckin, M.D., 107 Girard Blvd. S. E., Albuquerque

New York

MEDICAL SOCIETY OF THE STATE OF NEW YORK, OTOLARYNGOLOGY SECTION

CHAIRMAN: Samuel F. Kelley, M.D.
SECRETARY: Daniel C. Baker, Jr., M.D., 903 Park Ave., New York 21

NEW YORK ACADEMY OF MEDICINE, SECTION ON OPHTHALMOLOGY

CHAIRMAN: Harold W. Brown, M.D.
SECRETARY: George N. Wise, M.D., 30 W. 59th St., New York
TIME AND PLACE: Third Monday of each month; Afternoon sessions at hospitals (2:30 p.m.), evening sessions at New York Academy, room 20 (8:00 p.m.).

NEW YORK ACADEMY OF MEDICINE, SECTION ON OTOLARYNGOLOGY

PRESIDENT: Edmund P. Fowler, Jr., M.D.
SECRETARY: Darrell G. Voorhees, M.D., 135 E. 65th St., New York
TIME AND PLACE: 8:30 p.m., Third Wednesday of each month; New York Academy of Medicine, 2 E. 103rd St., New York 29

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

PRESIDENT: Joseph Laval, M.D.
SECRETARY: Leon H. Ehrlich, M.D., 211 Central Park West, New York 24
TIME AND PLACE: 8:30 p.m., Third Wednesday of each month; New York Academy of Medicine, 2 E. 103rd St., New York 29

CENTRAL NEW YORK EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: George Sisson, M.D.
SECRETARY: Wesley Bradley, M.D., 1100 E. Genesee St., Syracuse

EASTERN NEW YORK EYE, EAR, NOSE AND THROAT ASSOCIATION

PRESIDENT: H. G. Anderson, M.D.
SECRETARY: Frank C. Furlong, M.D., 713 Union St., Schenectady
TIME AND PLACE: First Thursday of November, January, February, March, April and June; Albany, Schenectady and Troy

ALUMNI ASSOCIATION OF THE NEW YORK EYE AND EAR INFIRMARY

PRESIDENT: Joseph H. Krug, M.D.
SECRETARY: John R. Finlay, M.D., Greenwich Medical Bldg., 49 Lake Ave., Greenwich, Conn.

BROOKLYN OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Ira W. Mensher, M.D.
SECRETARY: Nicholas P. Tantillo, M.D., One Hanson Pl., Brooklyn 17
TIME: Fourth Monday of November, January, March and May

BUFFALO OPHTHALMOLOGICAL CLUB

PRESIDENT: Howard H. Higgs, M.D.
SECRETARY: James Baker Vaughan, M.D., 129 Delaware Road, Kenmore 17, New York
TIME AND PLACE: Monthly; Sheraton Hotel, Buffalo

LONG ISLAND OPHTHALMOLOGICAL SOCIETY

PRESIDENT: Dr. Jesse Michaelson
SECRETARY: Dr. William Donnelly, 661 Long Beach Road, Rockville Centre, N. Y.
TIME AND PLACE: Dinner Meetings; Fourth Monday of February, April, September and November

North Carolina

NORTH CAROLINA EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: William D. Farmer, M.D.
SECRETARY: John S. Gordon, M.D., 412 North Church Street, Charlotte, N. C.

Ohio

AKRON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: R. H. Stahl, M.D.
SECRETARY: D. W. Mathias, M.D., 819 First National Tower, Akron 8
TIME AND PLACE: 6:30 p.m., First Monday of October, December, February and May; Akron City Club, Akron

CINCINNATI OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: Dr. William Thornell
SECRETARY: Dr. William Schrimpf, 3035 Clifton Avenue, Cincinnati 20
TIME AND PLACE: 6:30 p.m., Third Monday of each month; University Club, Cincinnati

CLEVELAND OPHTHALMOLOGICAL CLUB

PRESIDENT: Gerold T. Schwarz, M.D.
SECRETARY: James T. Mayer, M.D., 352 Hanna Bldg., Cleveland 15
TIME AND PLACE: Quarterly; Wade Park Manor, 107th St. and Park Lane, Cleveland

CLEVELAND OTOLARYNGOLOGICAL CLUB

PRESIDENT: R. L. Ruggles, M.D.
SECRETARY: R. W. Machamer, M.D., Rose Bldg., Cleveland
TIME AND PLACE: Second Wednesday of November, February, April and May; Wade Park Manor

COLUMBUS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: John E. Arthur, M.D.
SECRETARY-TREASURER: M. L. Battles, M.D., 370 East Town Street, Columbus 15, Ohio
TIME AND PLACE: First Monday of each month, October through April; University Club, 40 S. Third St., Columbus

TOLEDO EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Frank W. Taylor, M.D.
SECRETARY: Gail Ann Locken, M.D., 424 Woodruff, Toledo 2, Ohio
TIME AND PLACE: 6:00 p.m., Third Tuesday of each month; Toledo Club

Oklahoma

OKLAHOMA CITY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Jack Hough, M.D.
SECRETARY: J. C. Pickard, M.D., Pasteur Medical Bldg., Oklahoma City

Oregon

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: George Saunders, M.D.
SECRETARY: Donald C. Mettler, M.D., 1216 S. W. Yamhill St., Portland
TIME AND PLACE: Fourth Tuesday of each month; Aero Club of Oregon, 804 S.W. Taylor St., Portland

Pennsylvania

PENNSYLVANIA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Paul C. Craig, M.D.
SECRETARY: Daniel S. De Stio, M.D., 1006 Highland Bldg., Pittsburgh 6
TIME AND PLACE: May 19-21, 1960; Traymore Hotel, Atlantic City

WESTERN PENNSYLVANIA EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Carl E. Brant, M.D.
SECRETARY-TREASURER: F. E. Murdock, M.D., 28½ W. Scribner Ave., DuBois
TIME AND PLACE: Third Thursday of April and September; Indiana, Pennsylvania

WYOMING VALLEY EYE, EAR, NOSE AND THROAT CLUB

PRESIDENT: W. C. Marsden, M.D.
SECRETARY: Albert J. Abbott, M.D., 203 E. Green St., Nanticoke
TIME AND PLACE: Last Tuesday of each month, October through April; Luzerne County Medical Society Bldg., S. Franklin St., Wilkes-Barre

PHILADELPHIA COLLEGE OF PHYSICIANS, SECTION ON OPHTHALMOLOGY

PRESIDENT: Carroll R. Mullen, M.D.
SECRETARY: William E. Krewson III, M.D., 1930 Chestnut St., Philadelphia 3
TIME AND PLACE: Third Thursday of each month, October to May; College of Physicians, 19 S. 22nd St., Philadelphia

PHILADELPHIA COUNTY MEDICAL SOCIETY, EYE SECTION

CHAIRMAN: William C. Frayer, M.D.
SECRETARY: Ralph C. Lanciano, M.D., 259 South 17th Street, Philadelphia
TIME AND PLACE: First Thursday of each month; Philadelphia County Medical Society Bldg., 301 S. 21st St., Philadelphia

PHILADELPHIA LARYNGOLOGICAL SOCIETY

PRESIDENT: John O'Keefe, M.D.
SECRETARY: William Lell, M.D., 333 S. 18th St., Philadelphia
TIME AND PLACE: First Tuesday of each month; College of Physicians Bldg., Philadelphia

PITTSBURGH OPHTHALMOLOGICAL SOCIETY

PRESIDENT: John Dunbar, M.D.
SECRETARY: William G. Everett, M.D., 407 Jenkins Bldg., Pittsburgh 22
TIME AND PLACE: Third Monday of each month; Mellon Institute

PITTSBURGH OTOLOGICAL SOCIETY

PRESIDENT: Emory A. Rittenhouse, M.D.
SECRETARY: Clyde B. Lamp, M.D., Jenkins Arcade, Pittsburgh

READING EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Fred Perfect, M.D.
SECRETARY: James H. Parker, M.D., 238 N. Fifth St., Reading
TIME AND PLACE: 5:30 p.m., Third Wednesday of each month, September to June; Wyomissing Club

South Carolina

SOUTH CAROLINA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: L. D. Lide, M.D.
SECRETARY-TREASURER: Roderick Macdonald, M.D., 330 E. Main St., Rock Hill
TIME AND PLACE: September 12-14, 1960; King Cotton Hotel, Greensboro, N. C.

Tennessee

TENNESSEE STATE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: J. Thomas Bryan, M.D.
SECRETARY: William F. Murrah, Jr., M.D., 130 Madison Avenue, Memphis

CHATTANOOGA AND HAMILTON COUNTY EYE, EAR, NOSE AND THROAT SOCIETY

CHAIRMAN AND SECRETARY: J. E. Johnson, M.D., 4547 Brainerd Rd., Chattanooga 4
TIME AND PLACE: 6:30 p.m., Last Thursday of each month; Mountain City Club

KNOXVILLE SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: E. E. Miller, M.D.
SECRETARY: Frank Galyon, M.D., 715 Walnut St., Knoxville
TIME AND PLACE: Four times yearly; University of Tennessee Research Hospital

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

CHAIRMAN: Each member in alphabetical order
SECRETARY: William F. Murrah, M.D., 1720 Exchange Bldg., Memphis
TIME AND PLACE: Second Tuesday of each month; Memphis Eye, Ear, Nose and Throat Hospital

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: W. G. Kennon, M.D.
SECRETARY: Clyde Alley, M.D., Medical Arts Bldg., Nashville
TIME AND PLACE: Third Monday, October through May; Nashville Woman's Club

Texas

TEXAS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Lyle J. Logue, M.D.
SECRETARY: Oliver W. Suehs, M.D., 14 Medical Arts Square, Austin, Texas
TIME AND PLACE: December 2 and 3, 1960; San Antonio, Texas

DALLAS ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Dr. Tom McCrory
SECRETARY-TREASURER: Dr. David S. Stayer, 606 Medical Arts Bldg., Dallas
TIME AND PLACE: First Tuesday each month, Parkland Hospital

FORT WORTH EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: William Hendrix, M.D.
SECRETARY: Joe L. Bussey, M.D., 1201 W. Presidio, Fort Worth
TIME AND PLACE: First Friday of each month; St. Joseph Hospital

HOUSTON OPHTHALMOLOGICAL SOCIETY

PRESIDENT: William J. Snow, M.D.
SECRETARY: Carey J. Hargrove, M.D., 1216 Memorial Professional Bldg.
TIME AND PLACE: 8:00 p.m.; Second Thursday, September through January; Doctor's Club

SAN ANTONIO SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: F. X. Weixell, M.D.
SECRETARY: Dan A. Russell, Jr., M.D., 429 Medical Arts Bldg., San Antonio
CORRESPONDING SECRETARY: J. L. Mims, Jr., M.D., 211-212 Medical Arts Bldg., San Antonio
TIME: Third Tuesday of each month, September through May

Virginia

VIRGINIA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Maynard P. Smith, M.D.
SECRETARY-TREASURER: Marion K. Humphries, Jr., M.D., 104 E. Market St., Charlottesville
TIME AND PLACE: April 28-30, 1960; Williamsburg Inn, Williamsburg

TIDEWATER OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY

PRESIDENT: O. C. Jones, M.D.
SECRETARY: J. A. Klotz, M.D., 905 Wainwright Bldg., Norfolk 10
TIME AND PLACE: October, February and May; Tidewater area

RICHMOND, VIRGINIA, EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: R. K. Williams, M.D.
SECRETARY: Mason Smith, M.D., 2035 Monument Ave., Richmond 20
TIME AND PLACE: Third Tuesday of January, March, May and October; Commonwealth Club

Washington

WASHINGTON STATE MEDICAL ASSOCIATION,
SECTION ON EYE, EAR, NOSE AND THROAT

PRESIDENT: Claude K. Miller, M.D.
SECRETARY: Neil F. Thorlakson, M.D., 605 Cobb Bldg., Seattle 1

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: George H. Drumheller, M.D.
SECRETARY: Louis N. Hungerford, Jr., M.D., 1118 9th Avenue, Seattle 1
TIME AND PLACE: Third Tuesday of each month; Roosevelt Hotel

SPOKANE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Robert L. Pohl, M.D.
SECRETARY: Robert J. Davis, M.D., 305 Medical Center Bldg., Spokane
TIME: Fourth Tuesday evening of every other month

West Virginia

WEST VIRGINIA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

PRESIDENT: Nime K. Joseph, M.D.
SECRETARY: Albert Esposito, M.D., 1212 First Huntington National Bank Bldg., Huntington 1
TIME AND PLACE: April 11-12, 1960; Greenbrier Hotel, White Sulphur Springs

Wisconsin

MADISON, WISCONSIN, EYE, EAR, NOSE AND THROAT SOCIETY

PRESIDENT: Rollo Lang, M.D.
SECRETARY: John V. Berger, Jr., M.D., 224 W. Washington Ave, Madison
TIME AND PLACE: 6:00 p.m., First Tuesday of each month; Madison Club

MILWAUKEE OTO-OPHTHALMIC SOCIETY

PRESIDENT: Dr. Lee Eby
SECRETARY: Dr. George Roncke, 1225 West Mitchell Street, Milwaukee
TIME AND PLACE: Fourth Tuesday of each month, October through May; University Club

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